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AUTOMOBILE

Vol. XXXV
No. 2

NEW YORK, JULY 13, 1916

Ten cents a copy
Three dollars a year

Hudson Super-Six Endures The Supreme Test

The Hudson Super-Six, in many a test, has proved itself the greatest car that's built.

No car has ever matched it in hill-climbing. No other stock car ever went so fast. None ever went so far at top speed. And no motor of its size ever showed such reserve power.

Best Record By 52%

A Hudson Super-Six with stock chassis was driven 1819 miles in 24 hours on the Sheepshead Bay track on May 2nd. The average speed was 75.8 miles per hour.

That car, in a single round of the sun, went the distance from New York to Denver. It went 52 per cent farther than any other stock car had ever gone in that time. One man drove it all the way. No man could do that in a car which was not vibrationless. That man went farther in 24 hours than a man ever traveled before.

50 Miles In One

Some engineers figure that one mile at racing speed equals 50 miles of ordinary driving, in wear and strain on motor.

This car had run 2,000 miles before that test, at average speed of 80 miles per hour. So this 24-hour run made 3,800 miles which the car had been run at top speed—as high as 102 miles per hour.

Yet no part or bearing, when the engine was inspected, showed any appreciable wear.

The Thing You Want

What you want in a car above all else is reliability. And that's what these tests are proving.

It would take ten years of road work, perhaps, to show what we prove in a few days of speed work.

In all our tests we use a stock chassis.

The motor is exactly the same as in every Hudson Super-Six. So every man who buys a Super-Six gets the same super-endurance.

Excels Costly Racing Cars

At Sheepshead Bay speedway, at Chicago, and on other race tracks Hudson Super-Sixes—practically stock—showed greater stamina than the costliest special racing cars.

While great racing motors went to pieces under the terrific strain, the Hudsons ran through grueling contests without a stop.

Their speed was not always equal to winning first prizes, though they always were "in the money" and always were the sensation of the race because of their marvelous staying powers.

A Patented Motor

The Super-Six motor is a Hudson invention, controlled by Hudson patents. The principle which gives its utter smoothness is entirely new. That is why it out-performs any other car that's built.

It develops 76 horsepower from a small, light Six. That is 80 per cent more than old types. You rarely use that power. In ordinary driving you run at half its capacity, so the motor is never strained.

But the owner of a Super-Six knows that he has the power. He knows that his car is a master. He knows that in speed, in hill-climbing, in quick pick-up, no car can do what his does.

He takes pride in those facts. But his chief satisfaction lies in the car's endurance. He knows that his car will last. That another car at half the price might cost more in the long run.

Don't consider a fine car until you know the Super-Six. You would surely face years of regret.

While we are not now in a position to add new dealers with assurance of immediate deliveries, still we solicit correspondence from established dealers who are now making plans for the future

7-Passenger Phaeton, $1475 at Detroit (Seven other styles of open and closed bodies)

Hudson Motor Car Company, Detroit, Mich.

Stewart

Speedometers for Fords

The Market Grows Bigger Every Day

Run through the pages of this book.
Note the preponderance of Ford accessory advertisements.
They point out a tremendous market—and one that is growing bigger every day.
Think it over and remember—
No Ford accessory is needed, demanded, or advertised like the Stewart Speedometer for Fords.

"No car is better than its accessories"

The Stewart-Warner Speedometer Corporation
Chicago, Ill., U. S. A.

$10

The History of the Pneumatic Tire—9

Advantages of the Wired-Base Tire—Many People Did Not Believe in the Pneumatic Construction, But Favored the Solid Type—Inventions of 1892

The History of the American Automobile Industry—36

By David Beecroft

WITH the wire-edged tire the fabric could be rather long for a given rim size, and therefore loose and free to yield longitudinally. Accordingly, it could pass over an obstacle without lifting the wheel to such an extent or straining the fabric so much.

Wired-Base Tire Gains

To state the matter in another way: We may consider the constrictive tire tread as a section of a boiler shell, having the diameter of the wheel, whereas the strain on the fabric of the wired-base tire is that of a boiler shell, having the diameter of the tire itself. These diameters vary extremely, the wheel diameter being in modern automobile practice eight to ten times the tire diameter. It is not possible, however, to find in tires as actually constructed this difference, because the fabrics used are generally placed so that their threads are more or less diagonal and each tire partakes to some extent of the advantages and disadvantages characterizing the other. The wired-base tire, at first in a very small minority because the Dunlop was never properly introduced in America, has grown until it has a wide following. Its progress therefore has been more rapid than that of the clincher type.

In this struggle for a solution of the tire problem there were a very large number who did not believe in the air or pneumatic tire. It seemed incredible that the busy American public would bother with vehicles having tires that could be incapacitated by the distressingly common tack or nail in the city streets or the osage orange hedge thorn of the Middle West. Many inventors, therefore, clung to the belief that the pneumatic tire would be short-lived and some all-rubber substitute take its place, while others aimed to make such a compromise as would give them a rideable cushion tire in case the pneumatic deflated.

The Victor Arched Tire

Not only was the Victor arch tire pushed as a substitute for the pneumatic, but the Pope company held for a considerable time to the cylindrical all-rubber tire and gradually worked from this to the cylindrical inflated tire, later called hose pipe. These tires, however, would crack longitudinally above the rim where the most bending occurred and finally the top would separate from the base with results often dangerous to a bicycle rider.

To overcome this, Duryea, in 1891, brought out a cushion tire having its cushioning chambers placed radial to the wheel instead of the circumferentially placed. These holes, or air spaces, permitted the rubber around them room to compress but did not cause this rubber to bend or fold upon itself, and so it was free from the breaking so common to the other tires. Instead of the rim extending up each side of the rubber base, and inclosing a considerable weight and cost of dead rubber in the base, this Duryea cushion tire had lips at each edge of its base which extended into grooves in the rim and were cemented therein. This made a secure fastening, as it was almost impossible to pull these lips out of the grooves and the amount of dead rubber in the tire was almost nil.

Many Forms in 1892

The year of 1892 brought out a constant succession of new tire forms, some of which were radically different, and others were simply modifications of the better known types. The ideal tire of Phelps & Dingle resembled the Dunlop except that the wires were not endless, but were passed through the rim at one point and tightened by nuts. The tendency of any tire to creep around the rim rendered this form likely to tear the fabric where the wires came out of it and entered the rim, so this fastening did not find success.

Another inventor brought out a similar fastening, except the wire was endless and of double length. By putting the tire in place and drawing the wire coil tight in the tire edge, enough slack was secured in the second coil of the wire which was not in the tire edge to permit getting it over the edge of the rim. This left the tire with some slack as soon as the two coils or lengths of the wire had found their position, but with the lightly inflated bicycle tires this slight looseness did not matter much. The great danger was that the fabric would tear when the wires came through it, so this form was abandoned.

The Rostrum

Operation of an Automobile Engine

EDITOR THE AUTOMOBILE:—Please publish particulars regarding the work of an engine in an automobile. Can you explain to me the running of an automobile motor from the time it is started until it has stopped? By this, I mean, just what parts come into action, at what time and how?

Flint, Mich. M. P.

—This is a very elementary proposition as there is nothing very complicated to the automobile engine. From the time it is started until it is switched off at the end of the run the following operations take place:

The engine is first cranked. In the older cars this is done manually by turning a hand crank on the end of the crankshaft. In the modern engine the cranking is done mechanically by an electric motor. The starting switch is closed, allowing current to flow from the storage battery to the starting motor. This motor is in engagement with the crankshaft of the engine and as it turns over due to the electric current from the storage battery it cranks the engine. During the cranking of the engine the downward motion of the pistons on the suction stroke draws in air into the carbureter and gasoline from the carbureter jet. These mix in the mixing chamber of the carbureter and pass into the engine through the intake valve. The next stroke compresses the charge in the cylinder and when the piston reaches the top of the stroke a spark occurs, due to the electric ignition apparatus operated in connection with the engine.

This spark explodes the gas compressed in the cylinder which causes it to exert a pressure due to its quick expansion upon the head of the piston, pushing the piston down which in turn carries with it the connecting-rod that rotates the crankshaft. The crankshaft is connected with the clutch and then the drive passes back through the gearbox, driveshaft and axles to the wheels. Once the first explosion has occurred the action of the engine after that becomes automatic and necessity for the cranking medium ceases to exist. While one cylinder is exploding another is taking in a fresh charge, in the multi-cylinder engine. The action of the four-cycle engine as used in automobiles is to draw in the gas on one stroke, compress it on the succeeding, explode it on the next and exhaust it on the last. The drive is from the piston to the connecting-rod and then to the crankshaft. Geared to the crankshaft is the cam action for the valve and the auxiliaries such as the generator, ignition distributer unit, etc. All motion is stopped as soon as the ignition is switched off, stopping the gases when exploded.

Order of Magneto Spark Delivery

Editor THE AUTOMOBILE:—A six-cylinder engine fires 1, 4, 2, 6, 3 and 5; the magneto is geared 1½ to 1. Are cylinders 1, 2, 3 sparked by one cam of the magneto and cylinders 4, 5, 6 sparked by the other cam?

Nashua, N. H. W. H. C.

—A magneto generally gives two sparks to the revolution, therefore, when geared 1½ to 1 the magneto furnishes six sparks for every two revolutions of the crankshaft or three sparks per revolution. Since the engine will fire 1, 4, 2 on the first revolution, cylinder No. 1 will have the top break, cylinder No. 4 the lower break, and cylinder No. 2 the top break. On the next revolution cylinders 6, 3 and 5 will fire allowing No. 6 to have the lower break, 3 the top and 5 the lower. Thus, the same cam breaks fire cylinders 4, 6 and 5 and 1, 2 and 3 as you state in your letter.

Adjusting Differential on 1915 Reo

Editor THE AUTOMOBILE:—Kindly publish diagram of differential of 1915 Reo and give manner of adjustment. This car has too much slack in driving shaft, which I believe to be from transmission back. Advise how to adjust this.

I have a friend who drives a Hupmobile and to every tank of gasoline he adds a quart of cylinder oil. He insists that it is a benefit and that it would likewise prove beneficial to the Reo. Both motors are in perfect condition. Kindly advise me whether or not this adding of oil would improve running of Reo motor and if so, please explain why.

Coushatta, La. S. M. C.

—The lost motion you speak of as existing in the driveshaft is something that cannot be adjusted without securing new universal blocks. This probably will remove the condition which now exists. The diagram you request is not necessary in making the matter clear.

The practice of adding oil to the gasoline is quite a common one and will do no harm. However, if the cylinders are securing sufficient lubrication from the regular oiling system there is no necessity of increasing the amount of oil feed by adding it to the gasoline. This method of oiling a motor was used to a large extent when two-cycle engines were employed in automobiles. It is quite common to use cylinder oil in the gasoline in two-cycle marine practice even to-day.

Information on the Diesel Engine

Editor THE AUTOMOBILE:—Kindly publish information as to how the fuel oil is forced into the cylinder of the Diesel motor.

2—Is the fuel mixed with air, or oil alone forced in?

3—Is the fuel injecting mechanism of necessity slow speed?

4—What is the lowest compression that could be successfully used in the Diesel type with kerosene fuel?

5—What are the faults of the fuel-injecting mechanism as used on Diesel types of motors?

Tampa, Fla. L. C. H.

—The principle of the Diesel engine is as follows: It operates on the four-stroke cycle and has exhaust and inlet valves just like a conventional engine. The inlet valve admits pure air only and the compression space is very small, so that the air charged is brought to a high pressure. In the cylinder head there is a small valve through which fuel is forced by air raised to a very high pressure indeed in a separate three-stage pump. The degree of compression in the main cylinder has to be such that the charge of pure air will be heated to a temperature sufficient to ignite the fuel. Thus a Diesel gasoline engine would require moderately low compression while a Diesel engine for burning the heaviest

kind of crude requires a much higher compression. The reason that the Diesel engine has not been developed in small sizes is mainly the difficulty in handling extremely small quantities of fuel. In the Diesel system the high pressure air is admitted to the fuel valve at the top of the compression stroke and fuel is thrown in during nearly the whole of the working stroke, burning in the compressed air as it enters the cylinder. When a cylinder is so large that it will consume a wineglass full of fuel each stroke, it is easy to measure and control the fuel, but where it would need only a few drops the measurement becomes far more delicate.

Use Standard Bulbs on Dodge

EDITOR THE AUTOMOBILE:—Can 40 candlepower nitrogen headlight bulbs be used on a 1916 Dodge car without battery damage?

2—Approximately how much daylight driving would be necessary to keep the battery up?

3—When driving at night and indicator shows charge with all lights on, is the generator not supplying enough current to take care of lights and charge battery?

Canton, Ohio. T. L.

—We do not recommend the use of any other headlight bulbs than the standard 12 volt., 15 candlepower.

2—It is impossible for us to make any statement as to how much daylight driving would be necessary to keep the battery up. It depends entirely on how much night driving is being done, and how many times the car is started during the day. The starter-generator under the usual running conditions will keep the battery properly charged. If for any reason the car is subject to a lot of abnormal driving such as driving most of the time at night at low speeds and doing a great deal of starting during the day, the battery should be checked up by means of a hydrometer about once every two weeks. This will show whether the car is being driven enough at charging speeds, to keep the battery in good condition.

3—It does not necessarily mean when driving with the lights turned on and the battery indicator shows charge, that the battery is being charged, as only enough current may be generated to light the lights, as the indicator simply shows whether the starter-generator is charging or discharging. However, when traveling at 18 miles or more, the starter-generator will be charging the battery whether the lights are turned on or not.

Graphite as Lubrication Aid

Editor THE AUTOMOBILE:—I do quite a little car driving but do not have time to take care of my car. I would like to know whether flake graphite in the oil would be of any help, and how much? An oil man told me that it would keep an engine in perfect order as it reduced friction.

Chester, N. Y. C. F. J.

—If the proper grade of graphite is used it will be an aid to lubrication. It is very important, however, that you secure the correct graphite as all graphites are not lubricants, strictly speaking. The manufacturers of graphites can furnish you with the proper grade for various purposes.

Timken 5-Ton Worm-Driven Truck Axle

UP to this time the popular sizes of worm-driven truck axles have been within the range from ¾-ton to 3-ton, there has been a growing demand for this type of drive in larger truck units, and to meet such, the Timken-Detroit Axle Co., Detroit, Mich., has come out with a 5-ton unit that has long been in the process of development. This new Timken product is doubtless one of the largest axle types of the worm-drive form yet produced, and it speaks eloquently of the ability of the engineers who are responsible for its design.

This new axle has a pressed-steel housing of great strength, and is equipped with the Timken-David Brown worm gearing with Timken roller bearings. The worm is mounted over the wheel, and throughout the construction is typically Timken. That a large factor of safety has been used is evidenced from the fact that the axle is capable of carrying on the rear tires a weight of 15,000 lb.

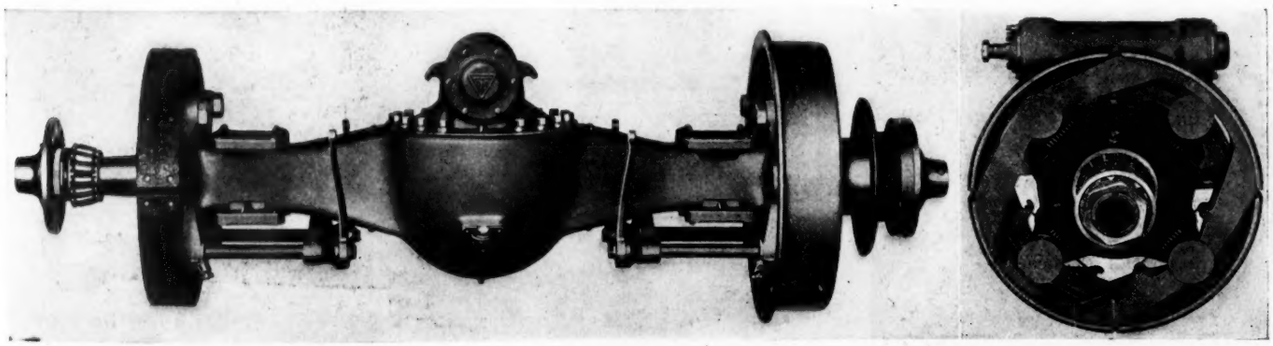
The load-sustaining portion is continuous from spring seat to spring seat, and is a pressing 6 in. square at either end under the spring seats, and enlarges to a spherical shape in the center to provide clearance for worm gear and differential. The square section at the ends has been used in order to give a firm seat for the spring saddles and added strength where it is needed. The center is open at the top for the attachment of the carrier flange which holds the worm shaft and its bearings, the worm gear, differential and bearings being in one complete unit. The ends of the housing are flanged to a large diameter and the brake spider is riveted to this flange substantially.

The axle is designed as a floating unit, and the wheel bearings are mounted on chrome-nickel steel tubes which extend inwardly toward the worm almost to the differential bearings, thus making a sturdy mounting for the shafts, the bearing supports being filler pieces welded and riveted to the housing, and the tubes forced into these filler pieces under great pressure. Thus the axle has a truss or bridge construction, which is the strongest type.

Brakes are 24 in. in diameter and 4 in. wide and are of the internal duplex form. Substantial flanges on the drums provide against distortion.

Some of the dimensions are:

Overall length—89⅞ in.
Centerline to bottom of housing—9 11-16 in.
Centerline to top of carrier—13⅛ in.
Centerline to forward end of worm shaft—13¼ in.
Centerline to centerline of spoke—69½ in.
Diameter of axle shafts—2¼ in.



Left—New 5-ton Timken floating worm-drive axle for trucks. Right—Brake construction and worm mounting

ACCESSORIES

Ryerson Connecting-Rod

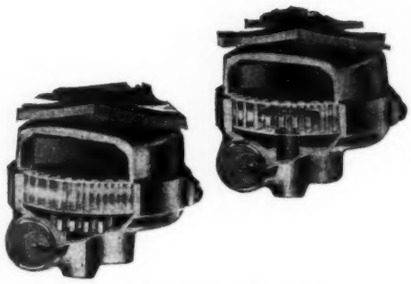
THIS new connecting-rod and bearing enables the owner or repair man to install in a Ford engine a bearing of the same type used in practically all the high-priced cars. The outstanding feature of this product is the fact that it does not require a complete overhauling of the engine but may be installed in a few minutes. When a car has been equipped with these Quick Change rods and bearings, new bearings may be slipped in when necessary without tearing down the entire engine. The bearing is the Glyco patented skeleton construction of reinforced babbitt, consisting of a strong skeleton introduced into a high-grade babbitt and finished with great accuracy. Special laminated shims come with each set of bearings which are inserted one on either side where the halves meet. These are composed of metal leaves 0.002 in. thick and are peeled off at intervals as the bearings gradually wear so that the fit will be as nearly perfect as possible at all times. Individual boxes each contain one complete connecting-rod and bearing.—Joseph T. Ryerson & Son, Sixteenth and Rockwell Streets, Chicago, Ill.

Muller Wash Lamp Stand

A large reflector with four lights is horizontally mounted on a vertical standard with a cast-iron base supported on three casters. The position of the reflector is adjustable. Fifteen ft. of cord are supplied. The device is guaranteed to be waterproof. Price, $10 and up.—Edward Muller, West New York, N. J.

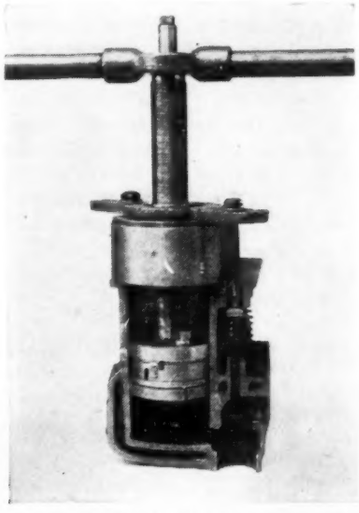
Rex Lock for Fords

The Rex lock replaces the regular Ford steering gear cover, and is attached to the internal gear case just below the steering wheel. The case contains an internal gear and pinions. When the key of the lock is turned, a geared sector is moved down between two of the gears, locking the steering gear so that it cannot be moved. Thus when the lock is set the car can move only as the front wheels are set, which may be straight ahead or at any angle. The maker states that the lock cannot be picked, and that if it were smashed the steering gear would be disabled. No drilling is required to install the device and only ordinary tools are needed. It sells for $4.—De Tamble Mfg. Co., Chicago, Ill.



Rex lock for Ford steering gear

Water, soap and towel in one can



Storm & O'Hair reboring tool outfit

Storm & O'Hair reboring tool outfit

Storm & O'Hair Reboring Tool

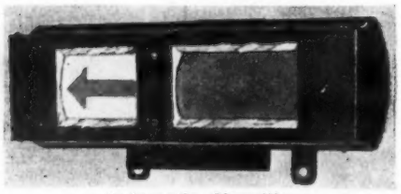
Cylinders used on any make of engine and from 2¾ to 5 1/16 in. diameter may be rebored by this adjustable machine which has two thread bars, one left and one right, the former being for Ford engines and the latter for all other makes. The regular machine is furnished with seven lead rings as follows: 3¾, 3⅞, 4, 4⅛, 4⅜, 4¼ and 4½ in. Price, $60. Small head and attachments for boring cylinders from 2¾ to 3¾ in., four lead rings. Price, $20. Large attachment, working in connection with regular machine, two lead rings, $15.—Storm & O'Hair, Thompson, Iowa.

Hand-I-Wash

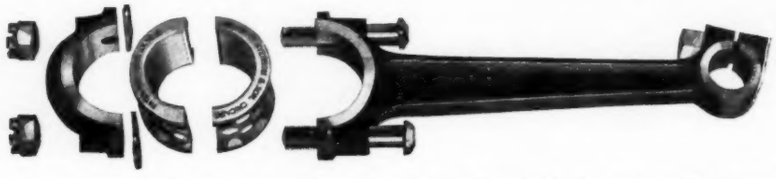
This is a combination of water, soap and towel put up in a can about 3 in. in diameter and 1 ft. high. By turning the outlet on the top of the can the liquid may be sprinkled on the hands and is just like soap and water. The hands are then dried by tearing off a section of the paper towel which is on a roller in the body of the can. Both liquid and towel may be purchased separately so that when the can is empty, it may be refilled. The liquid will remove all kinds of dirt, grease and oil, is antiseptic and neutral, containing neither acid nor alkali. Price $1; refiller, consisting of towel roll and tube of liquid 50 cents.—Tay-Miller Mfg. Co., 1714 Cherry Street, Philadelphia, Pa.

Automatic Signalite

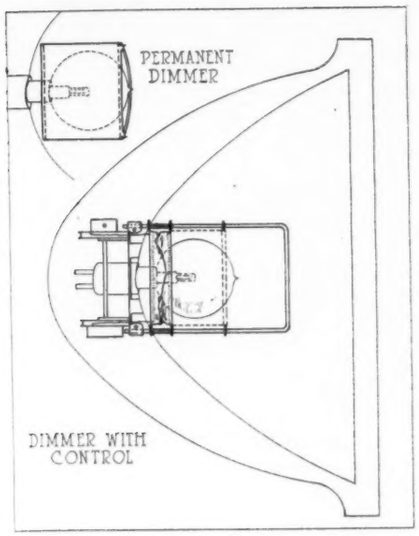
A rear safety signal which operates by day or by night and indicates when a



Automatic Signalite



Ryerson Quick Change connecting-rod and bearing assembly for use on Ford cars



O-U-Lite dimmer in which a cylindrical silk sleeve is used to remove the glare

turn to the right or the left is to be made, slowing down, stopping and backing to the right or left. These various functions are performed by the turning the steering wheel, depressing the brake, engage and reverse, etc. A hand lever attachment for indicating turns to the right or left will also be supplied, if desired. It is illuminated with a standard tail light bulb and carries the license plate. It may be attached to any car in 30 min., it is said.—Signalite Mfg. Co., Kansas City, Mo.

O-U-Lite Dimmer

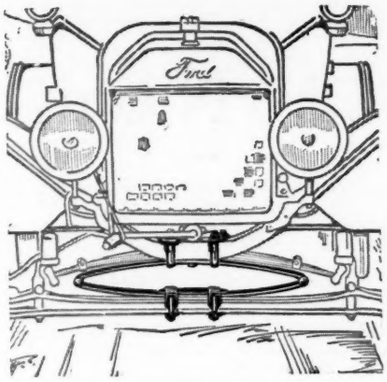
This is a small silk shade and in the permanent type is held by a metal frame and completely incloses the lamp bulb. In the control type the silk shade may be telescoped against the back of the reflector to give full power from the lamps. Price for electric lamps, $1, with control on lamps, $3.50, with control on steering post, $5.—O-U-Lite Co., Racine, Wis.

Twin Safety Spring Check

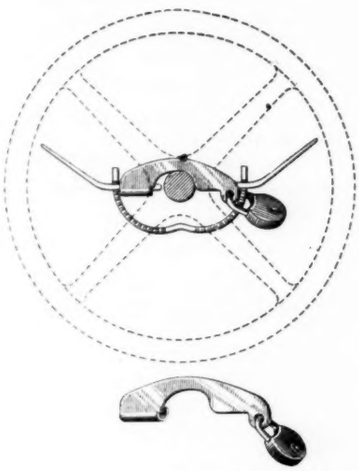
This is a device which is particularly for Ford cars and is designed to prevent side sway and lurching when driving at high speed or over rough roads, consists of a full elliptic single leaf spring which is clamped between the cross frame member and the front axle. Price, $3.—Twin-Rim Co., 103 Massachusetts Avenue, Boston.

National Mix-O-Lock

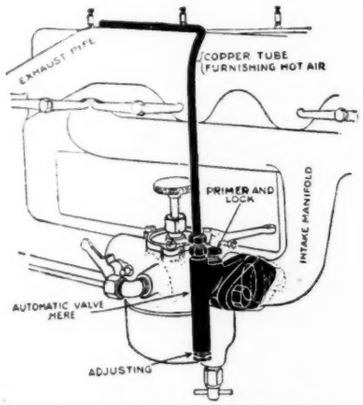
This device combines a gasoline saver, primer, carbon remover and lock for Ford cars, consisting of a flange which bolts between the carbureter and the intake. There are no holes to be drilled or capped; all that is required is a wrench. It contains an automatic valve which admits more air when required and has a plug which may be removed, thus preventing the starting of the motor, as



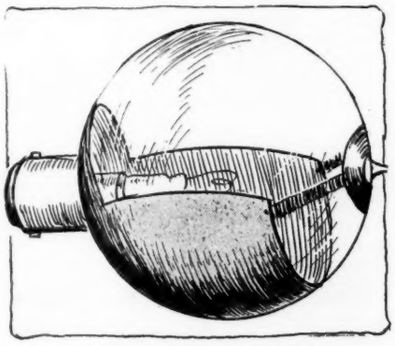
Twin safety check for Fords



Adams spark and throttle lock for use on Ford cars



National Mix-O-Lock for Fords



Perrin No-glare attachment

the absence of the plug renders it impossible for gasoline to be sucked from the spray nozzle. Price, $2.—National Motor Supply Co., 5606 Euclid Avenue, Cleveland, Ohio.

Perrin No-Glare

This device is not a dimmer but an intensifier of the light on the road. The No-Glare is a deflector made of special aluminum which fits snugly around the lower half of the light bulb, without any vibration or danger of breaking the bulb.

The Perrin device complies with the recommendations of the Society of Automobile Engineers, as none of the light rays are over 42 in. above the road at 75 ft. from the car. It gives 10 ft. of side light 10 ft. in front, and objects are clearly lighted 150 ft. in advance of the car.—Perrin Mfg. Co., Detroit, Mich.

Adams Spark and Throttle Lock

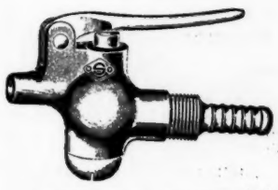
This lock is designed to control both the spark and throttle levers on Ford cars, hooking over one lever and being held to the other by a padlock. The devices are made of sheet steel and nickeled, the lock being a four-tumbler type and furnished with two keys. Price 50 cents.—A. L. Adams, 18 Normond Street, Springfield, Mass.

Stevens Air Cleaner

This device, called the Stevens automatic blow cock and cleaner, is designed for dusting the cars, cleaning motors, removing chips from bench and machine tools, etc., wherever compressed air is available. It is provided with a convenient operating handle and the valve has a tapered metal seat. Price, 75 cents.—Stevens & Co., 375 Broadway, New York City.

Wall Handle for Soldering

This steel handle for soldering coppers is designed to stay in its place indefinitely without breaking, splitting or burning, which wood handles will not do. The handle is of pressed steel, of heavy gage, and a grooved projecting member provides a seat for the iron tang of the soldering copper. Once the handle and tool are put together they are practically permanently attached. The makers state that the handle will not grow too hot for comfort, no matter how hot the copper may be. Made in three sizes: No. 1, for 1 and 1½-lb. coppers; No. 2, for 2 and 3-lb. coppers, and No. 3, for coppers up to 6 lb.—Stewart & Co., New York City.



Stevens air cleaner

Automobile Nomenclature

Complete Report of the Nomenclature Committee of the S. A. E. as Accepted by the Society at Its Summer Meeting—Correct Names for All Car Parts

AFTER a number of meetings held during the past year in conference with engineers and representatives of service departments responsible for the naming of car parts in their own organizations, the following list of names has been prepared and is offered for acceptance by the Society.

An attempt has been made to include in the list the more important parts throughout the whole car, bolts, studs and the like being indicated in general terms. Body parts have not been included generally nor parts of some units such as carbureters, which vary so much in construction as to make anything like uniform nomenclature very difficult.

Definitions of different types of construction have been included for several units in order to encourage uniform terminology in descriptions appearing in the trade press and in catalogs, as well as in the technical discussions of the Society. Definitions of different types of bodies are also included, because it is thought that some authority should take action to make possible the use of names which will be understood generally, rather than those which are meaningless except to persons conversant with the terminology peculiar to individual manufacturers. It is surprising how many distinctly different types of body are being sold under the name "brougham," for instance.

A scheme of classification based entirely on assemblies is impracticable for general use, on account of diverse arrangement of elements of so-called conventional cars. The classification proposed is therefore based largely on function.

In its present form the report can be used as a guide in making up lists of parts, or for any purpose by those familiar with automobile construction. It is probable that at some time in the near future sketches illustrating various of the parts listed in the report will be supplied.

DIVISION I—CYLINDERS

Group
1—Cylinders.
2—Crankcase.
3—Crankshaft.
4—Starting-crank.
5—Connecting-rods.
6—Pistons.

DIVISION II—VALVES

1—Camshaft.
2—Valves.

DIVISION III—COOLING SYSTEM

1—Fan
2—Radiator.
3—Pump.
4—Pipes and Hose.

DIVISION IV—FUEL SYSTEM

1—Carbureter and Inlet Pipe.
2—Carbureter Control.
3—Carbureter Air Heater.
4—Fuel Tank.
5—Fuel Pipes and Feed System.

DIVISION V—EXHAUST SYSTEM

1—Exhaust Manifold.
2—Exhaust Pipe and Muffler.

DIVISION VI—LUBRICATION SYSTEM

1—Oil Pan or Reservoir.
2—Oil Pump.
3—Oil Pipes, Strainers, Gages.

DIVISION VII—IGNITION

1—Spark-plugs, Cables and Switches.
2—Ignition Distributor.
3—Magneto.
4—Ignition Control.

DIVSION VIII—STARTING AND LIGHTING EQUIPMENT

1—Generator.
2—Starting Motor.
3—Wiring.
4—Battery.

DIVISION IX—MISCELLANEOUS ELECTRICAL EQUIPMENT

1—Lamps and Wiring.
2—Switches and Instruments.
3—Horn.
4—Miscellaneous.

DIVISION X—CLUTCH

1—Clutching Parts:
Cone Clutch.
Disk Clutch.
Plate Clutch.
2—Releasing Parts.

DIVISION XI—TRANSMISSION

1—Transmission.
2—Shifting Mechanism.
3—Control.
4—Propeller-shaft.

DIVISION XII—REAR AXLE

1—Housing.
2—Torque Arm and Radius-rod.
3—Drive Pinion.
4—Differential.
5—Axle Shafts.

DIVISION XIII—BRAKES

1—Outer Brake.
2—Inner Brake.
3—Pedal (or outer) Brake Control.
4—Hand (or inner) Brake Control.

DIVISION XIV—FRONT AXLE AND STEERING

1—Axle Center.
2—Steering-knuckles.
3—Steering-rods.
4—Steering-gear.

DIVISION XV—WHEELS

1—Front Wheels.
2—Rear Wheels.

DIVISION XVI—FRAME AND SPRINGS

1—Frame.
2—Frame Brackets and Sockets.
3—Front Springs.
4—Rear Springs.

DIVISION XVII—HOOD, FENDERS AND SHIELDS

1—Hood.
2—Engine Shield.
3—Fenders and Running-boards.
4—Windshield.

DIVISION XVIII—BODY

1—Floor-boards and Dash.
2—Body
3—Upholstering.
4—Top.

DIVISION XIX—ACCESSORIES

1—Speedometer.
2—Tire-pump.

General

Where terms "front" and "rear" are used, "front" should always be toward the front end of the car. These terms are sometimes confused in regard to parts that are mounted on the dash. The front side of the dash is always that next the engine.

Where parts are numbered, No. 1 should be toward the front of the car. For instance, No. 1 cylinder is the one nearest the radiator (in conventional construction).

"Right" and "left" are to the right- and left-hands when sitting in one of the seats of the car.

Studs, screws and bolts shall take names from parts they serve to hold in place, although they are assembled with other parts. For example, the cylinder stud is permanently screwed into the crankcase but holds the cylinder in place.

The name "engine" should be used rather than "motor" to avoid confusion with electric motors and to secure a lower freight rate.

DIVISION I—CYLINDERS

Group 1—Cylinders.
Cylinder:
L-head cylinder (valves on one side of cylinder).
T-head cylinder (valves on opposite sides of cylinder).
I-head cylinder (valves in cylinder head).
F-head cylinder (one valve in head, other on side directly operated).
(Cast in block, not cast en bloc.)
(Cylinders of V-type engines should be numbered IR, IL, 2R, etc.)
Inlet-valve cap.
Exhaust-valve cap.
Valve-cap gasket.
Cylinder-head.
Cylinder-head gasket.
Cylinder-head plug.
Water-jacket top cover.
Water-jacket top cover gasket.
Water-jacket side (or front or rear) cover.
Valve-spring cover.
Valve-spring-cover gasket.
Valve-spring-cover stud.
Valve-stem guide.
Priming-cup.

Group 2—Crankcase:
Crankcase.
Barrel-type crankcase.
Split-type crankcase (split horizontally, at or near center line of crankshaft).
Crankcase upper half.
Crankcase lower half (used only when the lower half contains bearings. A crankcase of either barrel or split type, in which all the bearings are mounted directly on the part to which the cylinders are attached, is called a "crankcase," the terms "upper half" and "lower half" not being used).
Oil pan (used for lower part of split-type or barrel-type crankcase, whether this serves as an oil reservoir or not).
Oil-pan drain-cock (or -plug).
Breather.
Oil-pan gasket.
"Bushing" instead of "bearing" for removable and renewable lining used in a plain bearing.
Crankshaft front bearing bushing (upper half and lower half).

Crankshaft front bearing cap.
Crankshaft front bushing support (sometimes used in barrel-type crankcase).
Crankshaft rear bearing bushing.
Crankshaft rear bearing shims (other shims accordingly).
Crankshaft center bearing bushing (if only three bearings or if all except end bearings are alike).
Crankshaft second bearing bushing, etc. (if more than three bearings, for example, front bearing, second bearing, third bearing, fourth bearing, rear bearing).
Hand-hole cover.
Hand-hole-cover gasket.
Timing-gear cover.
Timing-gear-cover gasket.
Flywheel housing.
Generator bracket (other brackets take name of part supported).

Group 3—Crankshaft:
Crankshaft.
Flywheel.
Crankshaft timing-gear (or sprocket).
Crankshaft timing-gear key.
Flywheel starter gear.
Crankshaft starter sprocket.
Flywheel studs.
Clutch-spring stud.
Crankshaft starting jaw (or pin).

Group 4—Starting-crank:
Starting-crank.
Starting-crank jaw.
Starting-crank shaft.
Starting-crank handle.
Starting-crank-handle pin.

Group 5—Connecting-rods:
Connecting-rod.
Straight connecting-rod } V-type engine.
Forked connecting-rod }
Connecting-rod cap.
Connecting-rod bushing (upper half and lower half).
Connecting-rod cap stud (or bolt).
Connecting-rod cap nut.
Connecting-rod bearing shims.
Connecting-rod dipper.
Piston-pin bushing.

Group 6—Pistons:
Piston.
Piston-pin.
Piston-pin lock-screw (in connecting-rod or piston).
Piston-ring.
Piston-ring groove.

DIVISION II—VALVES

Group 1—Camshaft:
Camshaft.
Eccentric shaft (Knight engine).
Camshaft timing-gear.
Camshaft timing-gear key.
Camshaft idler gear.
Camshaft oil-pump gear.
Camshaft ignition-distributor gear.
Exhaust cam.
Inlet cam.
Oil-pump eccentric (or cam).

Group 2—Valves:
Valves should be numbered 1 Ex, 1 In, 2 Ex, 2 In, etc., according to the number of the cylinder. On V-type engines the numbers should be 1 REx, 1 LEx, etc.
Poppet valve.
Inlet valve.
Exhaust valve.
Valve-spring.
Valve-spring retainer.
Valve-spring retainer lock.
Valve-lifter.
Valve-lifter guide.
Valve-lifter-guide clamp.
Valve-lifter roller.
Valve-lifter-roller pin.
Valve adjusting screw.
Valve adjusting screw nut.
Valve-rocker (either at cam or at overhead valve; if both, upper and lower).
Valve push-rod (intermediate between lifter and valve in I-head engine).

DIVISION III—COOLING SYSTEM

Group 1—Fan:
Fan.
Stationary fan support.
Adjustable fan support.
Fan hub.
Fan-blades.
Fan pulley.
Fan-belt.
Fan driving pulley.

Group 2—Radiator:
Radiator core.
Radiator shell.
Radiator upper tank.
Radiator right side.
Radiator left side.
Radiator lower tank.
Radiator filler-cap.
Radiator strainer.
Radiator drain-cock.

Group 3—Pump:
Water-pump.
Water-pump impeller.
Water-pump-impeller key.
Water-pump body (in case of doubt, body is member mounted on engine).
Water-pump cover.
Water-pump shaft.
Water-pump gland (part in contact with packing, whether threaded or not).
Water-pump-gland nut (or screw, or other part used to compress gland).
Water-pump shaft gear.

Group 4—Pipes and Hose:
Engine water outlet.
Engine water inlet.
Radiator hose (upper and lower).
Radiator water fitting (upper and lower).
Water-pump outlet pipe.

DIVISION IV—FUEL SYSTEM

Group 1—Carbureter and Inlet Pipe:
Carbureter.
Inlet manifold (more than one connection to cylinder).
Inlet pipe (only one connection to cylinder).
Inlet manifold or pipe gaskets (at cylinders).
Carbureter gasket.

Group 2—Carbureter Control:
(Throttle control rods will take names from parts they connect, shafts by location or arrangement, and brackets by parts they support).
Accelerator pedal.
Accelerator pedal bracket.
Accelerator pedal pin.
Accelerator pedal rod.
Accelerator pedal rod end pin.
Carbureter mixture hand-regulator.
Carbureter choke.

Group 3—Carbureter Air Heater:
Carbureter air heater.
Carbureter hot-air pipe.

Group 4—Fuel Tank:
Fuel tank.
Fuel reserve tank.
Fuel gage.
Fuel gage float.
Fuel gage glass.
Fuel tank outlet strainer.
Fuel tank outlet (flange, fitting, etc.).
Fuel tank pressure flange (or fitting).

Group 5—Fuel Pipes and Feed Systems:
Main fuel valve.
Reserve fuel valve.
Fuel pipe, main tank to auxiliary tank (or names of other parts connected).
Fuel pressure-pump (power pump).
Fuel hand-pump.
Fuel pressure-gage pipe.
Fuel pressure-gage tee.
Fuel pressure pipe to tank.
Fuel pressure pump pipe.
Fuel hand-pump pipe.
Fuel hand-pump tee.
Fuel pressure gage.

DIVISION V—EXHAUST SYSTEM

Group 1—Exhaust Manifold:
Exhaust manifold.
Exhaust manifold gasket.

Group 2—Exhaust Pipe and Muffler:
Muffler.
Exhaust pipe (extends from exhaust manifold to muffler. If in more than one part name sections front and rear. For V-type engines with two pipes name right and left).
Muffler outlet pipe.

DIVISION VI—LUBRICATION SYSTEM

Group 1—Oil-pan or Reservoir:
Oil-pan.
Oil tank (when separate).
Oil-filler strainer.
Oil-filler cap.

Group 2—Oil-pump:
Oil-pump.
Oil-pump body (any type of pump).
Oil-pump plunger.
Oil-pump plunger spring.
Oil-pump inlet valve.
Oil-pump outlet valve.
Oil-pump shaft.
Oil-pump shaft gear (outside the pump).
Oil-pumping shaft gear (inside the pump).
Oil-pumping follower gear.
Oil-pump cover.

Group 3—Oil Pipes, Strainers, Gages:
(Oil pipes should be named from the parts they connect, as "Oil-pump to pressure-gage pipe.")
Circulating-oil strainer.
Oil-strainer cap.
Sight feed.
Sight-feed glass.
Oil level-gage.
Oil level-gage float.
Oil level-gage glass.
Oil pressure-gage.

DIVISION VII—IGNITION

Group 1—Spark-plugs, Cables and Switches:
Spark-plugs.
Spark-plug cables (numbered according to cylinders).
Coil high-tension cable.
(Low-tension cables should be named from the parts they connect, as: "Storage battery to ignition switch cable." In case of more than one conductor the cable should be designated as double, triple, etc.)
Ignition coil.
Ignition switch.
Dry cell (two or more cells make a dry battery).

Group 2—Ignition Distributor:
Ignition-distributor breaker.
Ignition-distributor breaker-arm.
Ignition-distributor breaker-arm point.
Ignition-distributor fixed breaker-point.
Ignition-distributor brush.
Ignition-distributor shaft.
Ignition-distributor shaft gear.

Group 3—Magneto:
Magneto.
Magneto distributor.
Magneto breaker-box.
Magneto breaker-arm.
Magneto fixed breaker-point.
Magneto breaker-arm point.
Magneto distributor brush.
Magneto-collector-ring brush.
Magneto coupling, pump end.
Magneto coupling, center member.
Magneto coupling, magneto end.

Group 4—Ignition Control:
Spark control rod (name parts connected).
(Other control parts named as explained under throttle control.)

DIVISION VIII—STARTING AND LIGHTING EQUIPMENT

A one-unit system uses a starter-generator.
A two-unit system uses a generator and a starting motor.
A combined unit system uses a duplex starter-generator.

Group 1—Generator:
Generator.
Generator brush.
Generator brush-holder.
Generator gear.
Generator shaft.
Generator coupling (members as indicated under magneto coupling).

Group 2—Starting Motor:
Starting motor.
Starting-motor brush.
Starting-motor brush-holder.
Starting-motor pinion.
Starting-motor intermediate gear.
Starting-motor intermediate-gear shaft.
Starting-motor intermediate pinion.
Overrunning clutch.

Group 3—Wiring:
(Cables and conduits should be named from parts they connect.)
Starting switch.
Starting-switch pedal (or lever).

Group 4—Battery:
Storage battery.
Filler cap.
Terminal post.
Connector strip.

DIVISION IX—MISCELLANEOUS ELECTRICAL EQUIPMENT

Group 1—Lamps and Wiring:
Head-lamp.
Tail-lamp.
Side-lamp.
Instrument lamp.
Tonneau lamp.
Dome lamp.
Pillar lamp.
Inspection lamp.
Inspection-lamp cord.
Inspection-lamp plug.
Inspection-lamp socket.
Head-lamp socket.
Head-lamp support.
Head-lamp support tie-rod.
Tail-lamp support.
(Cables and conduits should be named from the parts they connect.)
Junction-box (wires not attached to box).
Junction-box screw.
Junction-box cover.
Fuse-box.
Fuse-box cover.
Fuse-block.
Fuse-clip.
Fuse (designated by name of part fed by circuit).
Junction panel.

Group 2—Switches and Instruments:
Lighting switch.
Ammeter.
Voltmeter.
Volt-ammeter.
Charging indicator.
Reverse current cut-out.
Current regulator.

Group 3—Horn:
(No names have been selected for horn parts.)

Group 4—Miscellaneous:
(Will include any additional electrical equipment, such as electrical gearshift.)

DIVISION X—CLUTCH

General

Plate clutch (one plate clamped between two others).
Disk clutch (more than three disks).
Dry disk clutch.
Lubricated disk clutch.
Cone clutch (leather faced, asbestos faced).
Expanding clutch.

Group 1—Clutching Parts:

Cone Clutch

Clutch cone.
Clutch facing.
Clutch-facing spring.
Clutch-facing-spring plunger.
Clutch spring.
Clutch thrust-bearing.
Clutch cone hub.
Clutch cone bushing.
Clutch-spring spider (for cone clutch with multiple springs).
Clutch-spring stud.
Clutch-spring retainer.
Clutch-spring nut.
Clutch spindle.
Clutch shaft (not attached to crankshaft).
Clutch shaft bearing (not in transmission case).

Disk Clutch

Clutch case (rotating member).
Clutch housing (non-rotating member).
Clutch cover.
Clutch housing cover.
Clutch driven disk.
Clutch driving disk.
Clutch driving disk stud.
Clutch pressure plate (front and rear, if two—used on both disk and plate clutches).
Clutch driven spider (or drum—driving and driven, if two).
Clutch cork-inserts.
(Facing, spring, thrust-bearing, etc., as under cone clutch.)

Plate Clutch

Clutch driven plate.
Clutch driving plate.
Clutch pressure levers.
(Other parts as under cone and disk clutches.)

Group 2—Releasing Parts:

Clutch release sleeve.
Clutch release shoe or clutch release bearing housing.
Clutch release bearing.
Clutch release fork.
Clutch release fork lever.
Clutch release fork shaft.
Clutch pedal shaft.
Clutch pedal adjusting link.
Clutch pedal.
Clutch pedal pad.
Clutch brake.
Clutch brake facing.

DIVISION XI—TRANSMISSION

Group 1—Transmission:

Transmission case (upper half and lower half, if bearings seat in both).
Transmission case cover.
Clutch gear.
Clutch gear bearing (front and rear, if two).
Clutch gear bearing retainer.
Countershaft.
Countershaft front bearing (if ball or roller).
Countershaft front bearing bushing (if plain bearing).
Countershaft front bearing retainer.
Countershaft rear bearing retainer.
Countershaft drive gear.
Countershaft second-speed gear.
Countershaft low-speed gear.
Countershaft reverse gear.
Reverse idler gear.
Reverse idler gearshaft.
Reverse idler gear bushing.
Transmission shaft.
Transmission shaft pilot bearing.
Transmission shaft pilot bearing bushing (if plain).
Transmission shaft rear bearing.
Transmission shaft rear bearing retainer.
Second and high sliding gear.
Low and reverse sliding gear.

Group 2—Shifting Mechanism:

High-gear shift fork.
Low-gear shift fork.
Reverse shift fork (if three are used).
High-gear shift bar.
Low-gear shift bar.
Reverse shift bar.

Group 3—Control:

Gearshift bar selector.
Gearshift lever shaft.
Low gearshift connecting-rod.
High gearshift connecting-rod.
Gearshift hand lever ("hand" may be omitted).
Gearshift hand lever bracket ("hand" may be omitted).
Gearshift housing (center control).
Gearshift gate.

Group 4—Propeller-shaft:

Propeller-shaft.
Propeller-shaft front universal-joint (assembly—"propeller-shaft" may be omitted).
Propeller-shaft rear universal-joint (assembly—"propeller-shaft" may be omitted).
Propeller-shaft front bearing (with inclosed shaft).
Transmission shaft universal-joint flange (substitute name of any other shaft on which flange is mounted).
Universal-joint flange yoke.
Universal-joint slip yoke.
Universal-joint plain yoke.
Universal-joint center cross (ring or block).
Universal-joint bearing bushing.
Universal-joint pin (may be designated as long and short, straight and shoulder, etc.).
Universal-joint inner casing.
Universal-joint outer casing.
Universal-joint casing packing.
Universal-joint casing nut.
Universal-joint trunnion (for trunnion type joint).
Universal-joint trunnion block.

DIVISION XII—REAR AXLE

General Types

Dead Axle—An axle carrying road wheels with no provision in the axle itself for driving them.

Live Axle—General name for type of axle with concentric driving shaft.

Plain Live Axle—Has shafts supported directly in bearings at center and at ends, carrying differential and road wheels.

(The plain live axle is practically extinct.)

Semi-Floating Axle—Has differential carried on separate bearings, the inner ends of the shaft being carried by the differential side gears and the outer ends supported in bearings.

The semi-floating axle shaft carries torsion, bending moment and shear. It also carries tension and compression if the wheel bearings do not take thrust, and compression if they take thrust in only one direction.

Three-Quarter Floating Axle—Inner ends of shafts carried as in semi-floating axle. Outer ends supported by wheels, which depend on shafts for alignment. Only one bearing is used in each wheel hub.

The three-quarter floating axle shaft carries torsion and the bending moment imposed by the wheel on corners and uneven road surfaces. It also carries tension and compression if the wheel bearings are not arranged to take thrust.

Full-Floating Axle—Same as three-quarter floating axle, except that each wheel has two bearings and does not depend on shaft for alignment. The wheel may be driven by a flange or a jaw clutch.

The full-floating axle shaft is relieved from all strains except torsion, and in one possible construction, tension and compression.

Types of Axle Drive

The different types of live axle can be driven by *Bevel Gear, Spiral Bevel Gear, Worm, Double-Reduction Gear* or *Single Chain.*

In other constructions the rear wheels are driven by *Double Chains, Internal Gears* or *Jointed Cross-shaft.*

Group 1—Housing:

Rear-axle housing (if one piece).
Right and left halves (if two pieces).
Bevel (or worm) gear housing, Right rear-axle tube, Left rear-axle tube } (if three pieces)
Rear-axle-housing cover.
Differential carrier (bolted to housing).
Rear-axle spring-seat.
Axle brake-shaft bracket (right and left).
Wheel brake-support, right and left ("wheel" may be omitted).
Wheel brake-shield ("wheel" may be omitted).

Group 2—Torque Arm and Radius Rod:

Radius rods.

Group 3—Drive Pinion:

Axle drive bevel pinion (or worm).
Axle drive pinion (or worm) shaft.
Axle drive pinion front bearing.
Axle drive pinion rear bearing.
Axle drive pinion thrust-bearing.
Axle drive pinion front bearing adjuster.
Axle drive pinion front bearing adjuster lock.
Axle drive pinion rear bearing adjuster.
Axle drive pinion rear bearing adjuster lock.
Axle drive pinion adjusting sleeve (containing both bearings).
Axle drive pinion (or worm) carrier.

Group 4—Differential:

Axle drive bevel (or worm) gear.
Differential.
Differential case, right.
Differential case, left.
Differential side gear.
Differential spider pinion ("spider" may be omitted).
Differential spider (or pinion shaft).
Differential bearing.
Differential thrust-bearing.
Differential bearing adjuster.
Differential bearing adjuster lock.

Group 5—Axle Shafts:

Axle shaft (right and left).
Axle shaft wheel-flange (or clutch).

DIVISION XIII—BRAKES

General

In the following list of brake parts the terms "outer" and "inner" are used, being applicable to any case of two sets of brakes on the rear wheels. Where the brakes are external and internal these terms may be substituted for "outer" and "inner." Where one brake is located at the wheels and the other at the transmission the terms "wheel brake" and "transmission brake" should be substituted. With other concentric or side-by-side brakes the terms "outer" and "inner" should be retained, "outer" indicating in the latter case the ones nearer the wheels.

The list is made up for external contracting and internal expanding brakes. If both brakes are of one type the necessary changes will be obvious. The designation of brake parts on the rear axle as foot-brake or hand-brake parts, or by equivalent terms, is too remote to be clear, especially in the case of stock axles whose brakes may be connected either way according to chassis design. Nearly the same condition prevails in regard to designating parts on the chassis according to whether they are connected to the inner or outer brakes at the axle.

The terms "service brake" and "emergency brake" should not be used. Better designations are "foot brake" and "hand brake"; or if both brakes foot-operated, "right foot-brake" and "left foot-brake."

Group 1—Outer Brake:

Outer brake band.
Outer brake band lining.
Outer brake band adjusting nut (yoke, etc.).
Outer brake hand lever.
Outer brake lever shaft.
Outer brake shaft inner end lever.
Outer brake shaft outer end lever.

Group 2—Inner Brake:

Inner brake shoe (or band).
Inner brake shoe (or band) lining.
Inner brake toggle (link, etc.).
Inner brake toggle lever.
Inner brake toggle shaft.
Inner brake cam.
Inner brake camshaft.
Inner brake camshaft (or toggle shaft) lever.

Group 3—Pedal (or outer) Brake Control:

Outer brake rod.
Outer brake rod yoke.
Outer brake intermediate shaft (or tube)—right and left.
Outer brake intermediate shaft (or tube)—right lever.
Outer brake intermediate shaft (or tube)—left lever.
Outer brake intermediate shaft (or tube)—center lever.
Outer brake right equalizer lever.
Outer brake left equalizer lever.
Outer brake equalizer.
Brake pedal.
Brake pedal rod.
Brake pedal rod yoke.
Brake pedal pad.
Brake pedal shaft.

Group 4—Hand (or inner) Brake Control:

Inner brake rod.
Inner brake rod yoke.
Inner brake intermediate shaft (or tube)—right and left.
Inner brake intermediate shaft (or tube)—right lever.
Inner brake intermediate shaft (or tube)—left lever.
Inner brake intermediate shaft (or tube)—center lever.
Inner brake right equalizer lever.
Inner brake left equalizer lever.
Inner brake equalizer.
Brake hand lever rod.
Brake hand lever rod yoke.
Brake hand lever.
Brake lever segment (or sector).
Brake lever pawl.
Brake pawl spring.
Brake pawl button.
Brake pawl finger lever.
Brake pawl rod.

DIVISION XIV—FRONT AXLE AND STEERING

Group 1—Axle Center.

Front axle center.
Front spring seats.
Front axle bushing.

Group 2—Steering Knuckles:

Right steering-knuckle.
Left steering-knuckle.

Steering-knuckle bushing (upper and lower).
Steering-knuckle pivot.
Steering-knuckle pivot nut.
Steering-knuckle thrust-bearing.
Right steering-knuckle arm.
Left steering-knuckle arm.
Steering-knuckle gear rod arm.

Group 3—Steering-rods:
Steering-knuckle tie-rod.
Steering-knuckle tie-rod end.
Steering-knuckle tie-rod clamp bolt.
Steering-knuckle tie-rod pin.
Steering-gear connecting-rod.

Group 4—Steering-gear:
Steering-gear case.
Steering-gear-case cover.
Steering-gear bracket.
Steering-gear arm.
Steering-arm shaft (if separate from sector or other operating member).
Steering-wheel rim.
Steering-wheel spider.
Steering-wheel tube (or shaft).
Spark and throttle sector.
Spark and throttle sector tube.
Spark hand-lever.
Spark hand-lever tube (or rod).
Throttle hand-lever.
Throttle hand-lever tube (or rod).
Steering-column tube (stationary).
Steering-column cowl (or dash or floor) bracket.

The various bushings in the steering-column take names from parts to which they are permanently fitted, being further distinguished as upper and lower, inner and outer, if necessary. Bushings in the steering-gear case take names from the worm and sector or other main operating parts which they support, as steering-gear worm upper bushing, although the steering-wheel tube may be the member which turns inside the bushing.

Steering worm, Steering-worm sector (or gear), Steering-worm shaft } (worm and sector gear)

DIVISION XV—WHEELS

Group 1—Front Wheels:
Front wheel felloe.
Front wheel felloe band.
Front wheel rim.
Rim bolts.
Rim clamps.
Front wheel hub.
Front wheel hub flanges.
Front wheel hub-cap.
Front wheel outer bearing.
Front wheel outer bearing inner race.
Front wheel outer bearing outer race.
Front wheel outer bearing balls.
Front wheel outer bearing ball retainer.
Front wheel outer bearing rollers.
Front wheel outer bearing roller cage.
Front wheel inner bearing (parts same as outer bearing).
Front wheel bearing spacer.
Front wheel bearing nut.
Front wheel bearing lock nut.
Front wheel bearing locking washer.

Group 2—Rear Wheels:
Rear wheel hub.
Rear wheel hub-flange.
Rear wheel hub-cap.
Rear wheel outer bearing.
Rear wheel inner bearing.
Wheel brake-drum.
(Other parts named like front wheel parts.)

DIVISION XVI—FRAME AND SPRINGS

Group 1—Frame:
Frame side member (right and left).
Front cross member.
Rear cross member.
Center cross member.
(As above if only three cross members; as below if more than three.)
First cross member.
Second cross member, etc.
Sub-frame side member (right and left).
Sub-frame cross member (front and rear).
Right rear gusset (upper and lower).
(Gussets at other cross members named according to member.)

Group 2—Frame Brackets and Sockets:
Front spring front bracket (right and left).
Front spring rear bracket (right and left).
Rear spring front bracket (right and left).
Rear spring rear bracket (right and left).
Running-board bracket (front, right, etc., if not duplicates).
Running-board bracket brace.
Engine front support bracket.
Engine rear support bracket.
Torque-arm bracket.
Radius-rod bracket.

Group 3—Front Springs:
Front spring (right and left).
Front spring shackle.
Front spring shackle-bolt (upper and lower).
Front spring front bolt.
Front spring rebound-clip.
Front spring seat.
Front spring seat pad.
Front spring clip.
Front spring clip plate.
Front spring center-bolt.

Group 4—Rear Springs:
Rear springs (upper and lower for elliptic and three-quarter elliptic).
Rear spring pivot bolt (or pin), Rear spring pivot seat } (for half-elliptic cantilever spring)
Rear spring double shackle, Rear side spring, Cross spring. } (for platform spring)
(Other parts as for front springs.)

DIVISION XVII—HOOD, FENDERS AND SHIELDS

Group 1—Hood:
Hood.
Hood sill.
Hood handle.
Hood fastener.
Hood fastener bracket (spring, lever, etc.).

Group 2—Engine Shield:
Engine shield.
Engine shield fastener.
Engine shield bracket (spring, etc.).

Group 3—Fenders and Running-boards.
Running-board (right and left).
Running-board linoleum coverings.
Running-board outside binding.
Running-board inside binding.
Running-board front binding.
Running-board rear binding.
Running-board shield (right and left).
Right front fender.
Left front fender.
Right rear fender.
Left rear fender.
Fender support socket.
Right front fender front support.
Right front fender rear support.
(Other fender supports accordingly.)

Group 4—Windshield:
(Names for windshield parts have not been selected.)

DIVISION XVIII—BODY

Types of Bodies

Roadster—An open car seating two or three. It may have additional seats on running-boards or in rear deck.

Coupelet—Seats two or three. It has a folding top and full-height doors with disappearing panels of glass.

Coupe—An inside operated inclosed car seating two or three. A fourth seat facing backward is sometimes added.

Convertible Coupe—A roadster provided with a detachable coupe top.

Clover Leaf—An open car seating three or four. The rear seat is close to the divided front seat and entrance is only through doors in front of the front seat.

Touring Car—An open car seating four or more with direct entrance to tonneau.

Salon Touring Car—A touring car with passage between front seats, with or without separate entrance to front seats.

Convertible Touring Car—A touring car with folding top and disappearing or removable glass sides.

Sedan—A closed car seating four or more all in one compartment.

Convertible Sedan—A salon touring car provided with a detachable sedan top.

Open Sedan—A sedan so constructed that the sides can be removed or stowed so as to leave the space entirely clear from the glass front to the back.

Limousine—A closed car seating three to five inside, with driver's seat outside, covered with a roof.

Open Limousine—A touring car with permanent standing top and disappearing or removable glass sides.

Berline—A limousine having the driver's seat entirely inclosed.

Brougham—A limousine with no roof over the driver's seat.

Landaulet—A closed car with folding top, seats for three or more inside, and driver's seat outside.

Group 1—Floor-boards and Dash:
Floor-boards (horizontal).
Toe-boards (sloping).
Heel-boards (under seats).
Dash (separates engine compartment from driver's compartment).
Instrument board.

Group 2—Body.*

Group 3—Upholstering.*

Group 4—Top.*

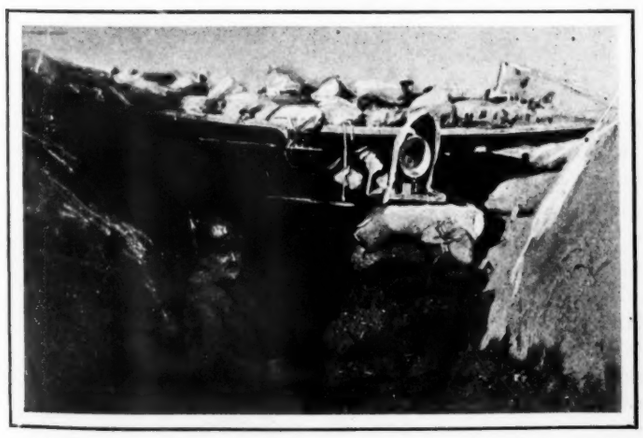
DIVISION XIX—ACCESSORIES

Group 1—Speedometer.*

Group 2—Tire-pump:
Tire-pump.
Tire-pump driving gear.
Tire-pump shaft gear.
Tire-pump idler gear.

*Names for parts in these groups have not been selected.

Klaxon Horn Warns of Gas Attacks



AT the left is a reproduction of a photograph of a listening post at the front in France. This photograph was brought to this country by William R. Fay, of the American Ambulance, who explains the listening post as being a point in the first line trenches nearest to the enemy. These posts are manned by volunteers as the work is extremely dangerous, the posts sometimes being only a few feet from the enemy parapet. The duty of the men is to warn the defending forces of impending gas attacks. In this connection an interesting use of automobile horns is made, each post being equipped with a Klaxon as shown in the illustration, the roar and rattle of shell and machine gun fire rendering a sharp, clear-cut warning note necessary, while a man's voice is absolutely lost in the clamor. The piece of sheet steel mounted over the horn is for the purpose of protecting it from shrapnel fire. When the trench defenders hear the horn shriek they throw on their gas masks and are in readiness.

THE AUTOMOBILE

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Fuel Commonsense

OF all proverbs the most true is that which says "a little knowledge is a dangerous thing." In this age when everyone has a smattering of scientific knowledge the public at large is a ready prey for the charlatan who can reel off a quasi-scientific tale. Even now in the twentieth century there are thousands of well educated people who are not aware of the impossibility of perpetual motion. The patent office has not yet ceased to have applications for thousands of machines that cannot ever operate. Thus when the claim is made that some liquid has been discovered of which a few drops will render water combustible there are plenty of persons to be found who fail to grasp the absolute scientific impossibility of the feat.

To do this would be the exact equivalent of turning ashes back into the coal from which they were formed, the equivalent of making bodies fall upward instead of downward.

Might Act as Carrier

There is only one way in which a water mixture could possibly serve as fuel and it is a way that is highly improbable to say the least. It is just conceivable that some high explosive, containing an immense amount of potential chemical energy might be dissolved in water and then burned while in suspension in a mist of spray, converting the water into steam. That such a solution would be capable of ignition by an ordinary sparking plug, or that it could be carbureted in the conventional way is almost as improbable as that such a solution could be made in the first place. Incidentally, it may be added, science has never yet discovered a cheap explosive, and that a few drops of liquid containing as much energy as a corresponding number of gallons of gasoline would be an explosive so powerful that its manufacture would be both difficult and dangerous.

The Laws of Energy

Scientific progress has taught us that what seems highly improbable to-day may be simple enough tomorrow, but the laws of energy remain the same as they have always been. Scientists know every substance from which the earth is made and they know the exact amount of energy which is available by burning those substances in the atmosphere. Science also knows how to make many other substances which will burn with much greater liberation of energy, but the making of the latter necessitates the expenditure of energy. In other words science has never discovered how to get more energy out of a substance than was put into it originally and the common fuels used by man contain the greatest amounts of natural or inherent energy. All our fuels are vegetable products containing the energy of the sunlight which shone upon them millions of years ago.

Thus while few things are utterly impossible, many are so improbable that they approach impossibility. Any liquid which would do what is claimed for the water energizer would not only solve the gasoline problem, it would revolutionize the entire artificial heat and power system of the world.

Important Trade News

IN this, and future issues of THE AUTOMOBILE the leading events of the week will be dealt with on the first few pages instead of in the center of the paper as hitherto. Trade news of lesser importance will conclude the editorial section, while all the articles and the regular features will form the center. We believe that very many of our readers turn to the news pages first of all and the latter will now be more readily accessible.

Better Work Wanted

WHILE there is no doubt that some of the cheapest of automobiles are well and carefully made, there is no doubt that a good many thousands of machines have been sold in the last few months which were really unfit to go into the hands of the user. Throughout the country there has been considerable complaint regarding the accuracy of fitting and assembling and, though the owner or dealer does not expect perfection of workmanship in an admittedly cheap car, he does not expect to have to overhaul the engine bearings after 500 miles of running. Some reputations are suffering.

$16,213,387 in Fees for Roads

This Is 90% of Total Collected in United States in 1915

WASHINGTON, D. C., July 3—Ninety per cent of the registration and license fees paid in 1915 by automobilists to the States, or $16,213,387, was spent for the building and maintenance of county and State roads, according to a compilation just published by the Office of Public Roads, U. S. Department of Agriculture. In all, 2,445,664 motor vehicles were registered in that year and their owners paid a total of $18,245,713 for registrations and drivers' and dealers' licenses. This is an increase of $5,863,760 over 1914, and an increase of 734,325 in the number of vehicles registered. Automobile fees now defray nearly 7 per cent of the total amount spent on rural road and bridge building, whereas in 1906 the income from this source was less than three-tenths of 1 per cent of the total expenditure.

Rapid Growth in Registration

The growth of the volume of fees and registrations is noted by the fact that in 1901 New York, the first State to require fees, collected only $954. In 1906 only 48,000 cars were registered throughout the entire United States. By 1915, however, the number had jumped to the figure given, so that there is slightly more than one motor car registered for each of the 2,375,000 miles of road outside of the incorporated towns and cities.

The relation between cars and road mileage varies widely in different sections. There is only one car for every 6 miles of rural road in Nevada, but nearly six cars for every mile of such road in New Jersey. There is an average of one car registration for every forty-four persons in the United States. Iowa apparently leads, however, with one car for every sixteen persons, while only one for every 200 persons is registered for Alabama.

It must be understood, however, that the figures of registration do not necessarily represent a total number of cars, as some of the States do not require annual registration, others group pleasure and commercial cars and motor cycles in their accounts, while still other States do not require registration of motorcycles.

There is great inequality in the registration fees charged by the different States. The average for the United States was $7.46. The State of Vermont, however, secured in 1915 a gross revenue of $18.10 for each car, while Minnesota received only about 50 cents annually for each car. In Texas and South Carolina no annual registration fees are collected, the only requirement being a county fee of 50 cents and $1 respectively for perennial registration. Most of the States, however, also levy annual taxes on motor vehicles and this adds importantly to the public revenue contributed by the owners of motor-propelled vehicles.

In the use of fees, however, there seems to be a general policy of applying the major part of the money collected from automobilists directly to road betterment. In forty-two of the States of the Union all or the major portion of the motor-vehicle revenue must be expended for the construction, improvement, or maintenance of the public roads, or for the maintenance of the State highway department. In twenty States, all or the major portion of the net motor vehicle revenues are expended by or under the supervision or direction of the State highway department. In seven States one-half to one-fourth of the State motor vehicle revenues are expended through the State highway department, and the remainder by the local authorities. Many States, in addition to applying license fees to road construction expend for this purpose a large part of the fines and penalties collected from owners.

California Leads in Fees

In the number of registrations New York State led in 1915 with 255,242; Illinois was second with 180,832; California third with 163,797; and Pennsylvania fourth with 160,137. In gross revenues received from this source, however, California led with $2,027,432; New York was second with $1,991,181; Pennsylvania third with $1,665,276; while Iowa, with 145,000 cars registered, came fourth in point of revenue with $1,533,054.

—

Cole Adds All-Weather Body

INDIANAPOLIS, IND., July 1—The Cole Motor Car Co., this city, has mounted an all-weather body on its eight-cylinder chassis. The Cole-Springfield body, as it is known, sells at $2,195. The car is called the Cole-Springfield Toursedan.

There are two other Cole models equipped with the new body. One is known as the Tourcoupé, selling for $2,195, and the other is the Towncar listed at $2,495.

The body is finished in American flag blue with dull block trimming and mouse gray upholstering. It has automatic electric door lights, which switch on and off as the doors are opened and electric light switches are located both at the driver's seat and in the tonneau.

The company will continue its standard eight, seven-passenger touring car and four-passenger Tuxedo roadster, which continue to sell for $1,595.

British Bar U. S. Cars July 16

Importation of American-Built Trucks Is Also More Closely Restricted

LONDON, ENGLAND, June 30—*Special Marconigram* to THE AUTOMOBILE:—The British Government has further restricted the importation into the United Kingdom of automobiles and commercial vehicles, which is to go into effect on July 16. Provision is made for the importation under licenses issued by the Government of such articles as may be approved by the authorities.

After July 16 the importation into the United Kingdom of such automobiles, trucks, chassis, parts and accessories, except tires, as were exempted from previous prohibition will be prohibited. Licenses to import such goods will be granted where goods were en route or were paid for on the date of the proclamation. Licenses for the importation of automobiles will be issued where the national interest is apparent or where trucks are required for fire departments, conveyances for wounded or sick, for police or local government authorities, agricultural purposes, or the conveyance of essential goods. Spare automobile parts may be imported under license when intended for imported commercial vehicles already in the United Kingdom.

A general license has been issued permitting the unrestricted importation of steel ball bearings and tool handles.

Fighting American Competition

This action, presumably by the Chancellor of the Exchequer, Reginald McKenna, culminates a long series of efforts on the part of the British trade to prevent further American competition. Tied up with government orders to such extent that they could not supply private users and later released to some extent for private trade with government contractors, British factories have been unable to supply British business men with motor delivery and haulage equipment. There are now some thirty lines of American trucks represented in England. Recently a number of releases of product for private sale were granted some of the truck firms which have since been withdrawn, so that with the demand for trucks greater than ever before and the home-manufactured product still largely taken up by the government, British business is to be forced by the government to put up with inferior equipment or no equipment at all lest American trucks secure too firm a foothold in the British market.

This action on the part of England tallies closely with that of France, which

has put a ban on all motor vehicles not ordered before May 8. An attempt is being made to exempt trucks from this drastic measure, as was successfully done at the time of the passage of the prohibitive tariff on motor vehicles in England; but the French effort is not apt to prove effective since the government is willing to rent trucks to government contractors as they may be required. They will be able to provide all of the vehicles that will be needed, since they can be purchased from America by the government. This will give the government of France complete control of the situation, so that the number of American trucks required to carry on the war will be sufficient and yet American enterprise will be prevented from securing a place in the French market.

—

Republic Truck Co. Adds $1,000,000 to Its Capital

ALMA, MICH., June 30—The Republic Motor Truck Co., has increased its capital $1,000,000, the former capital being $250,000. The company recently bought a large tract of land in this city and the cash increase will be used to improve this tract and triple the capacity of the plant. It has contracted for materials to build 18,000 trucks for 1917.

—

Cummins Monitor Capital $100,000

COLUMBUS, OHIO, July 1—The Cummins Monitor Co., this city, has increased its capital to $100,000.

—

Few Market Changes

NEW YORK CITY, July 3—The automobile materials market last week remained steady, with few price changes. Aluminum went down 3 cents a lb. to 60.

With the War Department taking bids on over 5000 trucks for immediate delivery to the Mexican border, the manufacturers in the West are urgently seeking to cover their requirements against prospective contracts. Several of the companies have sounded mills on steel for frames, taking material out of stock. One Western automobile plant has already secured a contract for 1500 trucks from the U. S. Government and placed a rush order for 4 and 6-in. channels.

Day and Warner on G. M. Board

—

General Managers of G. M. Truck Co. and Oakland Complete Directorate

DETROIT, MICH., July 3—Following a policy of having the various units of its organization as representative as possible on the board of directors, the General Motors Co., at a meeting in New York on June 27, elected W. L. Day, general manager of the General Motors Truck Co., and Fred W. Warner, general manager of the Oakland Motor Car Co., both at Pontiac, Mich., to the board of directors. These elections filled vacancies occasioned by the resignations on June 1 of three members of the banking interests that had aided in tiding the organization over its period of depression some years ago.

Fill Vacancies

Those resigning at the time of the election of W. C. Durant to the presidency to succeed C. W. Nash, were Albert Strauss of J. & W. Seligman & Co., J. J. Storrow of Lee, Higginson & Co., both of New York, and Emory W. Clark, head of the First and Old Detroit National Bank of Detroit. To fill one of these vacancies on the board, W. C. Leland, vice-president and general manager of the Cadillac Motor Car Co., was elected at the June 1 meeting, and Day and Warner have now completed the directorate.

Both Implement Men

Both Day and Warner are old farm implement men, who, like many others in the industry, graduated to the automobile business after long years of experience in the other line. Day came to the truck unit in 1912, leaving the Mitchell-Lewis Motor Co., where he was general manager. Before his connection with the latter concern he had been for 27 years general manager of the Parlin & Orrendorff Plow Co. at Kansas City. Warner 2 years ago took up the Oakland management, coming from Chicago, where he had managed the Buick branch. Prior to his connection with Buick he had long been connected with the John Deere Plow Co., also at Kansas City. Both men have made a striking success of the General Motors units they are now managing.

—

Willys-Overland Earns $4,377,799 in 4 Months

NEW YORK CITY, June 30—The Willys-Overland Co. reports to the local stock exchange for the 4 months ended April 30, 1916, net earnings all companies, $4,377,799; interest on floating debt, $184,655; surplus, $4,193,144.

The $1,500,000 Willys-Overland common stock which has just been listed on the Stock Exchange is the stock which was specifically reserved for that purpose when the authorized capitalization was increased by action of the stockholders last January.

Practically all of this $1,500,000 common stock has been allotted to employees, and is to be paid for in monthly instalments over a period of 10 years. No stock is to be delivered to the employees until all payments are completed, thus requiring 10 years before this stock is to be delivered.

—

Diamond 300% Cash Dividend

DETROIT, MICH., July 1—The Diamond Mfg. Co., one of the Detroit concerns that was recently taken over by the Motor Products Corp., of which W. H. Rands is president, is now paying its stockholders a 300 per cent cash dividend as a result of the change of control. In a letter to the stockholders it is explained that additional cash dividends will be forthcoming and that each will receive pro rata stock in the Motor Products Corp. The Diamond company had a capital stock of $300,000, of which two-thirds was outstanding.

—

Continental Pays 5 per Cent on Common

DETROIT, MICH., June 29—At a meeting of the directors here to-day the Continental Motors Co. declared an initial cash dividend of 5 per cent, payable July 15 to common stock of record July 5.

—

Autocar Co. Increases Capital to $1,800,000

ARDMORE, PA., June 30—The Autocar Co., this city, has declared a cash dividend of 5 per cent., payable to-day, and has also increased its paid-in capital from $300,000 to $1,800,000.

—

Stutz Stock All Purchased

NEW YORK CITY, June 30—The Stutz Motor Car Co. of America, which was recently organized by A. A. Ryan and associates, has completed the purchase of

Daily Market Reports of the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Week's Ch'ge
Aluminum, lb.	.63	.63	.63	.60	.60	— .03
Antimony, lb.	.18½	.17½	.17½	.17	.17	— .01½
Beams & Channels, 100 lb.	2.67	2.67	2.67	2.67	2.67	...
Bessemer Steel, ton	42.00	42.00	42.00	42.00	42.00	...
Copper, Elec., lb.	.26½	.26½	.26½	.26½	.26½	...
Copper, Lake, lb.	.26½	.26½	.26½	.26½	.26½	...
Cottonseed Oil, bbl.	10.80	10.80	10.87	10.80	10.75	— .05
Fish Oil, Menhaden, Brown	.55	.55	.55	.55	.55	...
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	...
Lard Oil, prime, gal.	1.05	1.05	1.05	1.05	1.05	...
Lead, 100 lb.	6.85	6.85	6.85	6.85	6.85	...
Linseed Oil, gal.	.64	.64	.64	.64	.64	...
Open-Hearth Steel, ton	42.00	42.00	42.00	42.00	42.00	...
Petroleum, bbl., Kans., crude	1.55	1.55	1.55	1.55	1.55	...
Petroleum, bbl., Pa., crude	2.60	2.60	2.60	2.60	2.60	...
Rapeseed Oil, refined, gal.	.92	.92	.92	.92	.92	...
Rubber, Fine Up-River, Para, lb.	.62	.67	.65	.65	.65	+ .03
Rubber, Ceylon, First Latex, lb.	.60½	.60½	.60	.60	.60	— .00½
Sulphuric Acid, 60 Baume, 100 lb.	3.00	3.00	3.00	3.00	3.00	...
Tin, 100 lb.	38.75	39.00	39.50	39.63	39.63	+ .88
Tire Scrap, lb.	.05¾	.05¾	.05¾	.05¾	.05¾	...

all the stock of the Stutz Motor Car Co. of Indiana.

The company is planning a larger output. In 1912 it produced 266 cars; in 1915, 1079, while for the 5½ months ended June 15 the output was 874 cars.

Within 4 or 5 weeks the new plant, which is as large as the existing factory, will be in operation. At the present rate, it is estimated that the company will earn in 1916 at least $750,000, which will be available for dividends, amounting to $10 a share on its 75,000 shares of stock, no par value.

H. C. Stutz remains president. The refinancing has brought in new blood, including, A. A. Ryan, G. H. Saylor, S. A. Fletcher and others.

—

Hare, Packard New York Sales Manager

NEW YORK CITY, June 29—E. S. Hare has been appointed manager of sales of the Packard Motor Car Co. in this city, under E. B. Jackson, president of the company. Mr. Hare comes from Philadelphia. From 1909 to 1916 he was vice-president of the Commercial Truck Co. of America, Philadelphia, and joined the Packard organization Jan. 1, 1916, as a special representative of the motor truck department.

—

Dividends Declared

White Motor Car Co., initial quarterly of 87½ cents a share, par value $50, payable July 15 to stock of record July 6. This places the stock on 7 per cent basis.

Swinehart Tire & Rubber Co., quarterly 1½ per cent, payable July 1. Books closed June 26.

Automobile Issues Are Active

—

Willys-Overland on $25 Par Basis—Stutz Reaches New High of 60⅞

NEW YORK CITY, July 3—Automobile issues last week were fairly active with few important changes. The stock of the Stutz company advanced to the new high price of 60⅞ on Friday. At this figure it was nearly 6 points above the figure at which subscriptions were received about 2 weeks ago.

United Motors went up 3 points on reports that interests identified with the property declared current earnings are at the rate of $12 a share on the outstanding stock, and that the management has in mind the payment of quarterly dividends at the rate of $6 a share early in October.

Overland Common High

Trading in Overland common began last week with the stock on a $25 par basis. It opened around 69 and later sold above 72.

Several of the issues on Saturday saw declines. Studebaker sold below 133 as against 137¼ for Friday; Maxwell common dropped to 79½, off 2⅝ points.

Peerless came into prominence after a long period of inactivity, and sold at 26 and 27, a gain of 2 points.

Studebaker common was one of the weak issues last week, with a drop of 24¼ points. No reason is given for the drop as the company has just made a very favorable report as to the sales during the first 6 months this year, which amounted to 36,700 cars against 20,400 for the same period of 1915, a gain of 16,300 cars, or 80 per cent.

One more issue has been put on the Stock Exchange. The Ajax Rubber Co. stock has had admittance to the Exchange to the value of $4,000,000.

—

Harry Newman Appointed Chalmers Distributor in Chicago

CHICAGO, ILL., July 3—*Special Telegram.*—Harry Newman, Inc., distributor of Chalmers cars in Wisconsin, northern Michigan and southeastern Minnesota since Dec. 1, 1915, has been appointed Chicago distributor. Distributing stations will be established in Springfield and Chicago. Contracts have been made with the Chalmers company to supply the new distributor with 5000 cars during the fiscal year ending July 1, 1917, which represents a season's business in excess of $6,000,000.

—

Ford Holds Sales Conference

DETROIT, MICH., July 1—The annual sales conference of the Ford Motor Co. has been in progress here this week, managers and assistant managers of the twenty-eight branches of the company in the United States, and of the fifty-one sales and service branches throughout the country being in attendance. These men are responsible to a large extent for the marketing of 500,000 Ford cars for the present fiscal year which ends July 31, and on them will depend a great deal

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Net Ch'ge
Ajax Rubber Co. (new)	..	..	64	66	..
J. I. Case pfd	70	79	86	90	—2
Chalmers Motor Co. com	91	92¾	..	180	..
Chalmers Motor Co. pfd	95	98	100	102	+1
Chandler Motor Car Co	..	..	108½	109	+ ½
Chevrolet Motor Co	..	..	215	220	+1
Fisk Rubber Co. com	..	..	..	150	..
Fisk Rubber Co. 1st pfd	..	..	114	120	..
Fisk Rubber Co. 2d pfd	..	..	120	..	..
Firestone Tire & Rubber Co. com	500	506	870	..	—10
Firestone Tire & Rubber Co. pfd	109	111	112	114	..
General Motors Co. com	156	157	470	541	..
General Motors Co. pfd	101	102	100	113	—2½
B. F. Goodrich com	53	54½	74½	75	+1½
B. F. Goodrich pfd	103	105	113⅜	113½	— ⅛
Goodyear Tire & Rubber com	269	272	230	240	..
Goodyear Tire & Rubber pfd	106	107	105	107	+1½
Grant Motor Car Co	..	..	12	13	..
Hupp Motor Co. com	..	..	8	84	..
Hupp Motor Co. pfd	..	..	90	110	—9
International Motor Co. com	13	14	9	12	..
International Motor Co. pfd	32	36	20	28	+2
Kelly-Springfield Tire & Rubber Co. com	159	152	70	72	+1
Kelly-Springfield Tire & Rub. 1st pfd	85½	86½	95	97	..
Lee Rubber & Tire Corp	..	..	47½	48½	—1
Maxwell Motor Co. com	35	35½	79	79½	—1⅜
Maxwell Motor Co. 1st pfd	82	83	85½	86	+ ½
Maxwell Motor Co. 2d pfd	31½	33	54½	55½	+ ½
Miller Rubber Co. com	190	192	350	357	..
Miller Rubber Co. pfd	103	105	105	106	..
Packard Motor Car Co. com	109	..	..	190	..
Packard Motor Car Co. pfd	96½	101	100	104	..
Paige-Detroit Motor Car	..	..	..	52	..
Peerless Truck & Motor Corp	..	..	26	27	+2
Perlman Rim Corp	..	..	..	..	..
Portage Rubber Co. com	35	38	119	120	..
Portage Rubber Co. pfd	92	95	120	122	..
Regal Motor Car Co. pfd	..	..	17	22	..
*Reo Motor Truck Co	15	16	38½	39½	+1¼
*Reo Motor Car Co	29¼	30	40	40½	— ½
Saxon Motor Car Co	..	..	79	83	—1
Standard Motor Co	..	..	7	8	..
Stewart-Warner Speed. com	67½	68¼	98	99	+1½
Stewart-Warner Speed. pfd	104	107	..	..	..
Studebaker Corp. com	76	78	113¼	133¾	—24¼
Studebaker Corp. pfd	100	100½	107¼	110	+ ¼
Stutz M. C. Co. of America	..	..	58	60	..
Swineheart Tire & Rubber Co	77	78	88	91	..
United Motor Corp	..	..	65½	66	+3
U. S. Rubber Co. com	45½	47	53¾	54½	+ ¾
U. S. Rubber Co. pfd	105	106	109¼	110	+ ¾
White Motor Co. (new)	..	..	57¾	58¼	+4¾
Willys-Overland Co. com	126	128	73	74	..
Willys-Overland Co. pfd	102	103½	106½	107½	+ ¼

Quotations furnished by John Burnham & Co.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Auto Body Co	..	..	..	..	..
Chalmers Motor Co. com	..	95	176	185	+6
Chalmers Motor Co. pfd	96	99	96	..	..
Continental Motor Co. com	185	..	35	37	—2
Continental Motor Co. pfd	82	86	9½	10½	..
Ford Motor Co. of Canada	1275	..	395	375	..
General Motors Co. com	153	156	470	545	—5
General Motors Co. pfd	101½	103½	..	116	..
Maxwell Motor Co. com	38	41	79½	82½	—1
Maxwell Motor Co. 1st pfd	83½	86	84½	87½	—1½
Maxwell Motor Co. 2d pfd	34	37	55	57½	— ½
Packard Motor Car Co. com	..	112½	..	185	..
Packard Motor Car Co. pfd	96¼	100	102	104	..
Paige-Detroit Motor Car Co.	..	..	..	50	..
*W. K. Prudden Co	19½	21	40	44	..
*Reo Motor Car Co	30	31	40	41	—1
*Reo Motor Truck Co	15⅜	16⅛	37½	39	—2¾
Studebaker Corp. com	76	78	134½	137½	—1½
Studebaker Corp. pfd	98½	100½	105	..	..
C. M. Hall Lamp Co	..	..	..	33	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	26	..	40	..
Kelsey Wheel Co	205	..	..	350	..
Regal Motor Car Co. pfd	..	25	17	..	..

¼

*Par value $10; others $100.

of the success of the contemplated marketing of 1,000,000 Fords for the next fiscal year. Somewhat over 500,000 cars will have been built when the present year ends, probably being in the neighborhood of 560,000.

—

New Record of 28,500 Goodyear Tires in 1 Day

AKRON, OHIO, June 30—The Goodyear Tire & Rubber Co., this city, on June 22 established a new production record of 28,500 tires, the best previous known record being 18,000 tires in a single day.

The company has 13,000 employees working in three shifts of 8 hr. To achieve the record run the company for 1 day put on a 12-hr. shift so as to utilize 6700 employees on each shift.

A year ago the company was producing about 12,000 tires on the daily average. Last month the gross sales were in excess of $6,000,000 and the total for the month will exceed $7,000,000.

—

Gearless Differential Reduces Prices

DETROIT, MICH., July 3—The Gearless Differential Co., this city, has reduced the price of its replacement differential on Ford and Chevrolet 490 models from $20 to $15; and on its Overland model from $25 to $20.

The company has reduced the cost of manufacturing on account of a much larger manufacturing schedule and the fact that it has been able to standardize many of the parts for the above models for the car and axle makers.

Overland Buys Out Leavitt

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Deal with Pacific Coast Distributor of Co.'s Products Involves $1,000,000

LOS ANGELES, CAL., June 30—The J. W. Leavitt & Co. organization is no more. The entire holdings of the company, which has distributed Willys-Overland products on the Pacific Coast, have been purchased by Willys-Overland, Inc., of Toledo. The deal involves practically $1,000,000 cash and is one of the most talked of changes in the automobile industry on the Pacific Coast in years. It is the first time that a factory has purchased an agency from a Pacific Coast dealer or distributor.

The new organization will operate in the form of two companies. The interests in California are to be known as the Willys-Overland of California and those in the Northwest as the Overland-Pacific, Inc.

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Stutz Features Newark Race

NEWARK, N. J., July 4—J. W. Dickinson in his Stutz Special again carried off the honors at the ½-mile dirt track meet held to-day at Olympic Park, this city. The ½-mile record of 37 2/5 sec., made by him on June 17 last, was shattered when both he and I. C. Barber of Washington, D. C., in an Eye See Bee Special, made the distance in 35 2/5 sec.

To-day's races were featured by closely contested events, the entry list including such cars as Jessop's Chevrolet, Gouirand and Moore's Mercers; and an Adams Special. The last named car, which had raced during the early part of the afternoon at the Sheepshead track, arrived near the closing of the local meet, and managed to participate in a special 3-mile race with Dickinson's Special and the Eye See Bee. The Stutz was put out on account of a punctured tire and the Adams Special just managed to beat the Eye See Bee.

A new 3-mile mark was hung up by Dickinson when he beat the old mark of 3:54 2/5 sec. by 15 sec., his time being 3:39 2/5.

—

Commercial Preparedness Keynote of Studebaker Dealers' Convention

DETROIT, MICH., July 1—Practically every eastern Studebaker dealer in the territory of the New York, Boston, Philadelphia and Norfolk, Va., branches attended the series of conventions held at these branches last week and part of the week before. The conventions were conducted by L. J. Ollier, vice-president and director of sales of the Studebaker Corp.; R. T. Hodgkins, general sales manager; H. A. Biggs, of Frank Seaman, Inc., advertising counsel, and C. F. O'Meara, efficiency expert.

Realizing that it would work a hardship on dealers to ask them to visit the factory at this time of the year, the

De Palma Wins Twin City 150-Mile Race

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(*Continued from page* 1)

Fourteen cars rolled across the tape for the start. Chevrolet had the pole, and his neighbors were Aitken, De Palma and Christiaens. In the second batallion were Rickenbacher, O'Donnell, Anderson and Galvin. The third row included Milton, Buzane, Henderson and Osteweg, and Sorenson and Muller brought up the rear. Cooper broke a connecting-rod in the trials and did not start.

The real fight for first money was between the first four until Chevrolet dropped out with a broken rocker arm at the end of the fifty-second mile. Christiaens, who led at the start, finished third. De Palma, who started second, ended first. Aitken, who was third, finished second. Milton, a local celebrity, gathered in fourth money and made a strong run. O'Donnell was fifth; Sorenson, local entrant, was sixth, and Muller seventh. Christiaens made a good race with De Palma. They were neck and neck at the end of the third lap and at 10 miles crossed the wire together. De Palma led in the sixth lap; up to the eighteenth Christiaens led by a good margin; then De Palma took the lead. Rickenbacher, who ran third, after the second lap had worked up to second place by steady driving and in the twenty-sixth lap jumped to the lead. This was notwithstanding a blow-out as Rickenbacher rounded the first quarter at 20 miles.

De Palma resumed the lead in the thirtieth lap, after a record of 93.30 miles average for the first 60 miles. Aitken made his way to the front in the thirty-eighth and held it for the next 6 miles, when he was nosed out by De Palma. Christiaens jumped back to the lead for two laps, and then Rickenbacher took the van for 22 miles. The lead then seesawed between Aitken and De Palma, Aitken dropping out in the sixty-ninth lap from tire trouble. Milton ran along about tenth place until he had covered nearly 50 miles, when he began to spurt up to third place. He ran steadily third and fourth until he had tire trouble in the fifty-third round. After 10 miles he dropped out again. For 6 miles he had a neck-and-neck brush with De Palma.

Rickenbacher dropped out at the end of 116 miles, leaving the fast field to De Palma, Aitken and Christiaens. Osteweg withdrew at the end of 30 miles, Galvin at the end of 42 miles. Henderson had 118 miles to his credit when the flag fell and Buzane ran only 138 miles.

De Palma used Mercedes carbureted and shock absorbers, Eisemann plugs, Bosch magneto and Monogram oil. Aitken used Miller carbureter, K. L. G. plugs, Oilzum and castor oil, Rudge-Whitworth wheels and Bosch magneto. Christiaens used Miller carbureter, K. L. G. plugs, Rudge-Whitworth wheels and Bosch magneto. Milton used Zenith carbureter, Rajah plugs, Oilzum, Rudge-Whitworth wheels and Bosch magneto. All the cars in the race used Bosch magnetoes except Muller's Dans L'Argent, which used Delco ignition. All but De-Palma's Mercedes used Dixon's graphite and Hartford shock absorbers. All used Motometers except Milton, O'Donnell and Muller.

factory officials came from Detroit to tell them of the company's plans for the year.

Commercial preparedness was the keynote of the gatherings at the eastern cities. A warning was sounded to dealers against any tendency to treat the immediate future as a period of easy sailing simply because the demand for automobiles at this time exceeds anything experienced in the past. It was pointed out that increased production will demand increased selling activity.

100,000 Cars Planned

Announcement was made to the dealers by Vice-president Ollier that the Studebaker Corp. plans a production of 100,000 cars beginning July 1. Sales for the past 12 months have been double those in any similar period, and practically another doubling of sales for the coming 12 months over the period just closing is provided to take care of the greater output. Information was given to the dealers regarding the factory's plans for selling the increased production of cars.

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Perfection Spring in U. S. Service

CLEVELAND, OHIO, July 5—The Perfection Spring Co. has been appointed by Secretary of War Baker responsible for the maintenance of the spring equipment on all United States government trucks in use in the Mexican campaign. E. O. Blanchard, president of the Perfection service station in this city, has left for the front in charge of the work for the local company.

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Rain Postpones Sioux City Race

SIOUX CITY, IOWA, July 4—*Special Telegram.*—A 3-hour cloudburst which visited this city early this morning transformed the local speedway into a pasty mass of mud and made necessary postponement of the Independence Day race meet until Saturday of this week. A number of the drivers disagreed on the time of postponement and the result was that several entrants withdrew their cars Dissatisfaction has been expressed among the drivers concerning the method of prize distribution without a stipulated guarantee. The arrangement here this year calls for a percentage division of the gate receipts among the winners. Several drivers have stated that they would refuse to appear again under similar conditions.

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Tacoma Races Cancelled

TACOMA, WASH., July 4—*Special Telegram*—The match race for the Northwest Championship at this city to-day was cancelled in the third lap, when Parsons went out with a broken connecting-rod.

1916 Gasoline Output Is Record

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140,000,000 Bbl. Marketed in First 6 Months, It Is Estimated

WASHINGTON, D. C., July 1—Some illuminating figures regarding the quantity of petroleum marketed in the United States during the first half of 1916 have been prepared by John D. Northrop, of the United States Geological Survey. He estimates that 140,000,000 bbl. were marketed during that period, his apportionment of the output among the major fields being as follows:

Appalachian, 11,400,000; Lima-Indiana, 1,800,000; Illinois, 7,900,000; Kansas and Oklahoma, 50,500,000; Northern and Central Texas, 4,200,000; Northwest Louisiana, 6,800,000; Gulf Coast, 11,400,000; Wyoming and Montana, 3,400,000; California, 43,500,000; miscellaneous, 100,000.

This quantity, which includes a little oil actually produced in 1915 but marketed during 1916, is appreciably less than the output during the first half of 1915, though it is greater by about 5,000,000 bbl. than one-half the entire quantity marketed last year. When it is considered that the first half of 1915 includes the period of maximum production of the Cushing pool in Oklahoma and the Crichton pool in northwestern Louisiana the disparity in output between the corresponding periods is not especially significant. The magnitude of this quantity, the fact that is is greater than one-half the total petroleum marketed in the United States in 1915, and the further fact that it reflects the results of general activity throughout all oil-producing areas rather than flush production in restricted areas is, however, significant and leads to no other conclusion than that the final satistics of oil marketed in 1916 are destined to establish a new record.

The outstanding feature of the petroleum industry during the half-year just closed was the high level reached in the prices of crude oil in March and maintained firmly to the end of the period. This level involves prices ranging from 90 to 350 per cent higher than those of a year ago for high-grade Eastern and Mid-Continent grades and reflects less strongly the decreased capacity of Cushing than it does the increased demand for crude oil.

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K. C. Speedway Nears Completion

KANSAS CITY, MO., July 3.—The new 1⅛-mile speedway south of Kansas City, being built by the Kansas City Speedway and Exposition Co., will be finished by July 10, and the first event will be staged July 22. Several drivers have signed up for the races, including Ralph De Palma, Hudson; Eddie O'Donnell, Duesenberg; Eddie Rickenbacher, Peugeot; Ralph Mulford, Hudson; Earl Cooper, Burman Special; Jack Gabel, Sunbeam; Art Klein, Miles Special; and there is an entry of H. J. Rahe's Hudson with racing body, Mr. Rahe making the entry from the K. C. Automobile Training School.

The track is a triple radius track, built of the black gumbo that people of this territory known to be pasty and to pack like glue—there will be no holes dug in it by the tires.

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Uniontown Hill Climb July 20

UNIONTOWN, PA., July 1—The fourth annual Summit Hill Climb under the auspices of the Uniontown Motoring Association will be held July 20 on the mountain course between Hopwood and Summit. There will be three automobile races, consisting of a free-for-all and two races for cars of limited piston displacement. Flying starts of 100 yd. will be given in each event. Entries will close July 17. More than forty cars are already entered, including De Palma. The management expects the entry of Mulford and the Christiaens brothers in their two Sunbeams.

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More Firms to Protect Soldiers

JACKSON, MICH., July 1—The Briscoe Motor Corp., this city, will place the families of its soldier employees on its payroll during the guardsmen's service to their country in Mexico. Their positions will also be held open for them until they return. It is reported that more than 1 per cent of the employees of the concern are guardsmen in the army.

Several of the automobile concerns in Long Island City will also protect their workmen. The Pierce-Arrow company will hold the men's jobs open until they return and give them full pay all the time they are away.

—

New Miller Tire

AKRON, OHIO, June 29—The Miller Rubber Co., this city, announces its new Millermolded black tread geared-to-the-road tire to be sold at a popular price. The company has been experimenting with this model for over a year.

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Peugeot Co. to Sell Premier

NEW YORK CITY, July 1—The Premier and the Peugeot cars will be sold together by the Peugeot Import Co., Broadway and Fifty-ninth Street.

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Oakland Branch in Dallas

DALLAS, TEX., July 1—C. L. Zutavern and others will open a factory branch of the Oakland Motor Co. here to distribute in Texas.

Factory Miscellany

To Make Vulcanizing Machinery—A new factory for the manufacture of vulcanizing machines was opened this week on West Chestnut Street, Canton, Ill. The company is in charge of F. A. Whitten, Charles Palmer and Abe Lewis. The machine produced is a timely invention. By a simple chemical process owners are enabled to repair a break in a tire within 5 minutes and without danger of burning the rubber. The operations of the company will be upon a small scale at the outset, but it is planned to expand as business warrants.

Gillette Tire Plant Progresses—Excellent progress is being made by the Gillette Safety Tire Co., Eau Claire, Wis., on the construction of its new plant and it is expected that the first tires will be coming through before Aug. 15. The main building, the first unit of the proposed group, is 60 x 250 ft. in size. It will be equipped with $30,000 worth of tire and rubber working machinery purchased from the Adamson Machinery Co., Akron, Ohio, and the total investment at this time will exceed $75,000. R. B. Gillette is general manager and J. S. Wilson is secretary. The initial output will be 150 tires daily and between eighty-five and 100 skilled workmen will be employed.

Wis. Factory Items—The Wald Mfg. Co., Eighteenth and Martin Avenue, Sheboygan, manufacturing accessories and parts, will erect an additional machine shop, 80 by 100 ft., one story high, made necessary by the rapid growth of its business.

The Four Wheel Drive Automobile Co., Clintonville, which has more than doubled the size of its works during the last year, is planning to erect a large new gray iron and malleable foundry during the late summer and early fall. A new machine shop, 100 by 200 ft., is now being completed. The company is working on large orders for army commercial vehicles for the American and European governments.

The Kurz & Root Co., Appleton, manufacturing electrical devices, has booked a large order from the United States government for the military electrical generating units which it has built for the last 18 months or more for foreign governments. The unit is designed for military camp service, in connection with the portable machine shops on motor trucks used generally for army service in this and foreign countries. The generator takes the place of the flywheel on a small four-cylinder, four-cycle gasoline engine and produced current for lighting camps as well as for wireless apparatus. The overall length of engine and generator is only 42 in.

The Pan-American Rubber Co., Milwaukee, has been organized with a capital stock of $200,000 to manufacture a patented inner tire, known as the cellular pneumatic inner tire. The concern takes over the business of the Sporub Tire Co., which has been manufacturing inner tires for about 10 months. Factory quarters have been leased in the Kopmeier Building, Third and Prairie Streets, and a large production is planned. At this time about fifty tires are being manufactured daily, but within a short time the number will be increased to 100, and within 60 days to 200. F. J. Ramler, H. C. Clauson and J. Kopmeier appear as incorporators of the new company. F. J. Ramler is president and general manager. He is half owner of the Standard Racine Rubber Co., Milwaukee, and a large stockholder in the Racine Rubber Co., Racine, Wis. He has been engaged in the rubber and tire business for more than 16 years. The cellular pneumatic tire is distinct from so-called tire fillers, in that it is virtually a pneumatic tube without the disadvantages of the ordinary tube and does not require inflation, and may be transferred from one casing to another.

Start Perfex Radiator Plant—Ground has been broken for the new plant of the Perfex Radiator Co., Racine, Wis., which established a factory in leased quarters about 4 years ago for the production of radiators for pleasure and commercial cars, trucks, tractors, etc. The main building will be 85 by 250 ft.

The Automobile Calendar

ASSOCIATIONS

July 9 - 13 — Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.

Sept.—Indianapolis, Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.

Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.

Dec. 2-9—Electricians' Country-wide Celebration.

CONTESTS

July—La Grande, Ore., Track Race, LaGrande Motor Club.

July — Burlington, Iowa, 100-Mile Track Race, Tri-State Fair.

July 8—Grand Rapids, Mich., 100-Mile Track Race, Auto. Business Assn.

July 14-15—Los Angeles to San Diego, Commercial Vehicle Endurance and Reliability Demonstration.

July 15 — Portland, Ore., Track Race, Northwest Auto Assn.

July 15—Omaha, Neb., Speedway Race.

July 15—North Yakima, Wash., Track Race, Hiller-Riegel Co.

July 20—Uniontown (Pa.) Hillclimb, Uniontown Motoring Assn.

July 22—Kansas City, West Speedway Race, Kansas City Speedway Co.

July 22—Oriskany Falls, N. Y., Hillclimb, Auto Club of Utica.

Aug. 5—Tacoma Speedway Race, Tacoma Speedway Association.

Aug. 11-12—Pikes Peak, Col., Hill Climb, Pikes Peak Auto Highway Co.

Aug. 12—Portland, Ore., Track Race, Hiller-Riegel Co.

Aug. 18-19—Elgin Road Race, Chicago Auto Club.

Aug. 26—Kalamazoo, Mich., 100-Mile Track Race.

Sept. 1-2—New York, N. Y., Sheepshead Bay Speedway, 24-Hour Race, Trade Racing Assn.

Sept. 4—Elmira, N. Y., Track Race, Elmira Auto and Motorcycle Racing Assn.

Sept. 4—Cincinnati, Ohio, Speedway, Cincinnati Speedway Co.

Sept. 4—Newark, N. J., Track Race, Olympic Park, Racing Assn.

Sept. 4—Indianapolis Speedway Race.

Sept. 4—Des Moines Speedway Invitation Race. Limited to six entries.

Sept. 4-5 — Spokane, Wash., Track Race, Inland Auto Assn.

Sept. 16—Providence Speedway Race.

Sept. 18—North Yakima, Wash., Track Race, Washington State Fair.

Sept. 29—Trenton, N. J., Inter-State Fair. H. P. Murphy, Racing Sec.

Sept. 30 — New York City, Sheepshead Bay Speedway Race.

Oct. 7 — Philadelphia Speedway Race.

Oct 7—Omaha Speedway Race.

Oct. 14 — Chicago Speedway Race.

Oct. 19—Indianapolis, Ind., Race Indianapolis Motor Speedway.

Oct. 21 — Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.

Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

GOOD ROADS

Sept. 6-7—St. Paul, Minn., Good Roads Congress, Auditorium.

SHOWS

Sept. 2-9—Columbus, Ohio, Fall Show, Ohio State Fair, Columbus Automobile Show Co.

Sept. 10-16 — Milwaukee, Wis., Show, Wisconsin State Fair, Machinery Bldg.

Aug. 2-9—Hollywood and West End, N. J., Show, Atlantic Exhibition Co.

Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.

TRACTOR

July 17-21—Dallas, Tex., Tractor Demonstration.

July 24-28—Hutchinson, Kan., Tractor Demonstration.

July 31-Aug. 4—St. Louis, Mo., Tractor Demonstration.

Aug. 7-11—Fremont, Neb., Tractor Demonstration.

Aug. 14-18—Cedar Rapids, Iowa, Tractor Demonstration.

Aug. 21-25—Bloomington, Ill., Tractor Demonstration.

Aug. 28-Sept. 1—Indiana Tractor Demonstration.

Sept. 4-8—Madison, Wis., Tractor Demonstration.

Sept. 11-16 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.

The AUTOMOBILE

VOL. XXXV NEW YORK—THURSDAY, JULY 13, 1916—CHICAGO NO. 2

U. S. Places Orders for Trucks Worth $3,500,000

Nine Makes of Vehicles, the Majority Being of 3-Ton Capacity, Included in Order—Two 5-Ton Types Are Ordered

WASHINGTON, D. C., July 8—Nine makes of vehicles are included in the motor truck order placed by the quartermaster general of the army during the past week—an order amounting to almost $3,500,000. Most of these nine makes are of 3-ton capacity, although two makes are of 5-ton capacity. In the purchase of these trucks the War Department has been largely governed by the recommendation of Gen. Frederick Funston, who has learned, through his subordinate officers, of the real needs of the army along motor truck lines, particularly the needs of the present service. Government officials here also are giving some consideration to the type of vehicles purchased to better regulate the models for military use.

To Simplify Purchases

By this means it will be possible, officers say, to eliminate the purchase of too many types, which would require the keeping of manifold parts and greatly add to the repair problem. It is entirely out of the question, experts declare, to adopt a single standard type, owing to the refusal of motor truck manufacturers to depart from their own distinctive designs, which are of commercial value. The order recently given was divided as follows:

Ninety-seven Riker, with bodies, 3-ton capacity; two Riker tank trucks; 8 Riker, with platform bodies, 3-ton capacity; 224 Peerless, with bodies, 3-ton; seventy-three Peerless chassis, 3-ton; two Peerless, platform bodies, 5-ton; twelve Peerless, platform bodies, 3-ton; six Reos, with bodies, ¾-ton; 264 Packards, with bodies, 1½-ton; 132 Packards, 3-ton; 528 Whites, with bodies, 1½-ton; thirty-three Whites, with bodies, 3-ton; ninety-nine Four Wheel Drive chassis, 3-ton; fifty-eight Kelly-Springfield, with bodies, 1½-ton; sixty-six Kelly-Springfield, with bodies, 3½-ton; ninety-nine Kelly-Springfield chassis, 3-ton; thirty-three Velie chassis, 1½-ton; thirty-three Velie chasis, 3-ton; 163 Packard chassis, 1½-ton; thirty-three Packard chassis, 3-ton.

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France Lowers Truck Duty

PARIS, June 28—*Received in New York July* 12—By the repeal of the import prohibition law, American trucks are now admitted to the French market on the pre-war tariff, which is roughly equivalent to 12 per cent of value. All passenger cars, however, are met by a 70 per cent import duty. This duty applies virtually to all vehicles weighing less than 2½ tons. The adoption of a weight limit instead of an attempt to define a commercial vehicle is a very intelligent move.

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Congress To Pass Trade-Mark Registration Law

NEW YORK CITY, July 1—Those manufacturers who are interested in export conditions will find it to their advantage by having their trade-marks registered. The United Export Bureau of THE AUTOMOBILE has received information from its agent in Chile, that Congress is about to pass a law in regard to the registration of trade-marks. Up to the present time, this has been a very simple procedure, but the Bureau is informed that in the future it will not be so easy, and above all, the expense for registering the trade-mark will be considerably higher than it is at present.

The United Export Bureau, which is thoroughly conversant with conditions in South America, is taking charge of this trade-mark work, charging a nominal fee to cover its expenses. Those makers wishing to procure the registration certificate may do so by sending the Bureau three copies of the trade-mark, also three photographs of the car which is to be registered.

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Gaston, Williams & Wigmore Profits $10,000 a Day

NEW YORK CITY, July 7—Gaston, Williams & Wigmore, exporters of trucks and automobiles, this week declared an initial dividend of $1 a share. Earnings thus far this year have increased steadily. For the period from date of organization, April 19, to May 31, profits were $400,000, or $10,000 a day. From Jan. 1 to April 19 they were $1,073,851, or at the annual rate of over $3,500,000, or approximately $10,000 a day.

For the current month, profits will run between $350,000 and $400,000, bringing the total for the first half year up to $1,800,000, or equivalent to $6 a share.

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S. A. E. Aeronautic Division to Meet

NEW YORK CITY, July 12—The aeronautic engine division of the S. A. E. standards committee will meet in Washington, Tuesday, July 18. Henry Souther will be chairman of the division and the first meeting will be attended by representatives of the aeroplane industry, government officials and officers of the army and navy.

7992 Cars and Trucks Valued at $8,426,928 Exported in May

Parts, Not Including Engines and Tires, Valued at $789,826—Total for 11 Months Period Is 71,175 Machines Worth $91,594,466—Parts, $20,649,739

WASHINGTON, D. C., July 8.—During May 1717 commercial cars, valued at $4,357,238, and 6275 passenger cars, valued at $4,069,690, and parts, not including engines and tires, worth $789,826, were exported to various countries. During the 11 months ended May the exports were as follows: Commercial cars, 19,849, valued at $53,254,400; passenger cars, 51,326, valued at $38,340,066; parts, not including engines and tires, $20,649,739.

In May a year ago 2426 commercial cars, valued at $6,583,912, together with 4821 passenger cars, valued at $3,971,483, and parts, not including engines and tires, to the value of $789,829, were shipped abroad. For the 11 months' period the exports were 11,006 commercial cars, valued at $30,561,880; 19,462 passenger cars, valued at $16,327,955, and parts, not including engines and tires, to the value of $6,714,001.

Europe Takes Most

As has been the case ever since the European war began, the bulk of our automobile shipments continue to find their way into Europe. A total of 877 cars, valued at $1,764,489, was exported to France in May last, as against 521 cars, valued at $1,106,572, shipped there in May a year ago. During the 11 months' period these shipments increased from 4472 cars, valued at $11,142,414, in 1915 to 7080 cars, valued at $18,054,753, in 1916.

The United Kingdom bought 975 machines, valued at $1,745,415, in May, a considerable falling off as compared to the purchases in May a year ago, which amounted to 4036 cars, valued at $5,895,856. However, this decline was nothing as compared with the big increase in the purchases for the 11 months' period, which in 1916 totaled 17,795 machines, valued at $24,705,017, as against 11,688 cars, valued at $16,736,165, exported in 1915.

Russia, which did not figure in the export tables last year, bought 359 cars, valued at $660,620, in May last, and that country's purchases of American cars during the 11 months' period of this year amounted to 5133 cars, valued at $15,528,974.

Denmark Becomes a Factor

Denmark is another country whose car imports from this country were not separately reported last year, but in May last we shipped there 210 machines, valued at $144,737, while during the 11 months' period the shipments totaled 807 cars, valued at $556,445.

There were no car shipments to Germany during any of the periods under consideration, but Italy took fifty-one cars, valued at $19,376, in May last and 307 cars, valued at $192,107, during the 11 months of this year. Twenty-three cars, valued at $17,004, were exported there in May a year ago. while during the 11 months' period the number was 111 and the value $75,372.

There was a big drop in our exports of cars to "other Europe," the shipments declining from 699 cars, valued at $1,638,709, in May, 1915, to 404 cars, valued at $392,189, in May last, and from 2817 cars, valued at $7,768,101, during the 11 months of last year to 2149 cars, valued at $2,651,331, during the same period of this year.

Shipments to Canada show a big increase from 838 cars, valued at $630,990, in May a year ago to 1779 cars, valued at $1,212,260, in May last and from 3606 cars, valued at $3,796,729, during 1915 to 9212 cars, valued at $6,368,633, in 1916.

Even war-ridden Mexico shows a healthy growth in its imports of automobiles from this country, fifty-eight cars, valued at $53,500, being shipped there in May last, as against three cars, valued at $4,407, exported in May a year ago, while during the 11 months' period the exports increased from sixty-seven cars, valued at $68,067, in 1915 to 396 cars, valued at $381,818, in 1916.

Another section of the world that is showing a fondness for American cars is the West Indies and Bermuda, which took 495 cars, valued at $296,798, in May last and 4355 cars, valued at $2,642,466, during the 11 months of this year. Last year the shipments there amounted to 262 cars, valued at $131,779, during May and 1383 cars, valued at $827,989, during the 11 months.

Under the heading "South American countries," we shipped 165 cars, valued at $88,631, in May a year ago, while during the 11 months of 1915 the exports there amounted to 1071 cars, valued at $583,119. This year the shipments have increased to such an extent that the various countries of South America are listed separately in the export tables and the figures are as follows: Argentina, 578 cars, valued at $279,736, in May and 4075 cars, valued at $1,910,679, during the 11 months of 1916; Brazil, thirty-two cars, valued at $14,944, and 236 cars, valued at $142,191; Chile, sixty-nine cars, valued at $62,736, and 773 cars, valued at $527,291.

Exports of Automobiles, Trucks and Parts for May and 11 Previous Months

	May				11 Months Ending May			
	1915		1916		1915		1916	
	Number	Value	Number	Value	Number	Value	Number	Value
Passenger Cars	4,821	$3,971,483	6,275	$4,069,690	19,462	$16,327,955	51,326	$38,340,066
Commercial cars	2,426	6,583,912	1,717	4,357,238	11,006	30,561,880	19,849	53,254,400
Parts, not including engines and tires	....	789,826	....	2,426,206	.....	6,714,001	.....	20,649,739
	7,247	$11,345,221	7,992	$10,853,134	30,468	$53,603,836	71,175	$112,244,205
By Countries								
Denmark	....	.....	210	$144,737	.....	.....	807	$556,445
France	521	$1,106,572	877	1,764,489	4,472	$11,142,414	7,080	18,054,753
Germany	....	.....	....	.....	20	20,164	.....	.....
Italy	23	17,004	51	19,376	111	75,372	307	192,107
Russia	....	.....	359	660,620	.....	.....	5,133	15,528,974
United Kingdom	4,036	5,895,856	975	1,745,415	11,688	16,736,165	17,795	24,705,017
Other Europe	699	1,638,709	404	392,189	2,817	7,768,101	2,149	2,651,331
Canada	838	630,990	1,779	1,212,260	3,606	3,796,729	9,212	6,368,633
Mexico	3	4,407	58	53,500	67	68,067	396	381,818
West Indies and Bermuda	262	131,779	495	296,798	1,383	827,989	4,355	2,642,466
South America	165	88,631	....	.....	1,071	583,119	.....	.....
Argentina	....	.....	578	279,736	.....	.....	4,075	1,910,679
Brazil	....	.....	32	14,944	.....	.....	236	142,191
Chile	....	.....	69	62,736	.....	.....	773	527,291
Venezuela	....	.....	16	12,025	.....	.....	432	276,495
Other South America	....	.....	94	63,355	.....	.....	547	319,643
British East Indies	....	.....	367	270,432	.....	.....	2,834	2,145,615
British Oceania	256	212,316	934	660,862	2,727	2,271,349	7,043	5,661,675
Asia and Other Oceania	241	588,116	558	687,468	1,581	2,708,004	4,736	6,148,853
Other countries	203	241,015	136	85,986	925	892,362	3,265	3,380,480
	7,247	$10,555,395	7,992	$8,426,928	30,468	$46,889,835	71,175	$91,594,466

Hupp Business Gains 47.3 Per Cent

Floorspace Increased 93.9%—Will Produce 18,000 Cars in Next 12 Months

DETROIT, MICH., July 10—With the close of the 1916 selling season, July 1, the Hupp Motor Car Corp. announced an increase in business over the 1915 season of 47.3 per cent. The gain in the Hupp corporation's business was made notable by the fact that for practically 8 months the main Detroit plant has been in the hands of builders. During the past season, the floorspace in the Hupmobile factories has been increased 93.9 per cent, practically doubling the space of 1 year ago.

With the buildings now being completed, the plants will have a capacity more than double that of 1 year ago. The company is installing approximately $500,000 worth of cost-reducing machinery and efficiency equipment in its Detroit and Jackson plants. In preparation for a steadily growing business, the company's investments in enlarging and improving the plants have in the past year aggregated approximately $1,000,000.

The number of factory employees has been increased 74.6 per cent, and an additional increase of nearly 1000 men will be made within the next 90 days, when the final factory additions are completed. A production of 18,000 to 20,000 cars is planned for the next 12 months.

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General Motors Directorate Includes Chrysler

DETROIT, MICH., July 10—Further revision of the directorate of the General Motors Co. was made at the quarterly meeting, when Walter P. Chrysler, the newly elected general manager of the Buick company, was made a director, following the resignation of S. F. Prior, who is prominent in the Union Metallic Cartridge Co. and the Remington Arms Co.

Thomas Neal, former president of the organization and chairman of the board, is again an officer by his election as vice-president at this meeting. He will share the duties of the vice-presidency with A. G. Bishop, the Flint banker, who was elected a vice-president last fall.

In placing Chrysler on the directorate, another of the General Motors subsidiaries was given representation on the board. Not long ago W. C. Leland, of the Cadillac company, was elected to the board, and with the placing of W. L. Day of the General Motors Truck Co., and F. W. Warner of the Oakland Motor Car Co. also on the directorate, there are four of the subsidiaries directly represented.

These recent director changes followed the resignations of J. J. Storrow, Albert Strauss, Emory W. Clark and S. F. Prior. The revised board as it now stands follows:

Pierre du Pont, chairman; J. H. McClement; C. S. Mott; C. W. Nash, Lammont Belin, A. H. Wiggin, C. S. Sabin, J. A. Haskell, J. J. Roskob, F. W. Warner, W. L. Day, W. C. Leland, W. P. Chrysler, Thomas Neal, W. C. Durant, L. G. Kaufman, and A. G. Bishop.

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New Thomas Truck Ready for Market

NEW YORK CITY, July 10—The Thomas Auto Truck Co., Inc., which was organized early this year by C. K. Thomas, formerly vice-president and general manager of the Federal Motor Truck Co. of New York, now has its 2-ton model ready for the market. Eventually there will be three other models rated at ¾-ton, 1-ton and 1½-ton. The 2-ton model is built entirely of standard units the principal specifications including a 4-cylinder, 4⅛ by 5½ Buda motor, selective three-speed gearset, dry-plate clutch in unit with the motor, worm drive, with Timken-David Brown worm and propulsion and torque taken through the spring. Frame is pressed steel with a total overall length of 214 or 232 in. Wood wheels are fitted with 34 by 4 front and 34 by 4 dual or 34 by 6 single rear tires. The steering wheel is at the left with control levers in the center. The standard wheelbase is 150 in. with 168 in. optional and the tread is 58 in. The loading space is 112 in. with 130 in. optional. Regular equipment includes Bosch lighting generator, electric lamps, 6-volt 110 amp.-hr. battery, electric horn, bumper, windshield, front fenders, tools, etc. The company does not manufacture bodies but will furnish conventional designs on orders. Special designs will also be produced.

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Reo Buys Out National Coil

LANSING, MICH., July 10—The Reo Motor Car Co. has bought out the National Coil Co., which employs about 100 men. The building will be used to extend the manufacturing facilities of the Reo company. Although no figures are given out, it was stated by an official of the Reo Motor Car Co. that it has been decided to build 50 per cent more Reo passenger cars for the season 1917. This will probably mean a total production of from 38,000 to 40,000 cars. A proportionate schedule has been adopted by the Reo Motor Truck Co.

Signal-Commerce Merger

To Be Known as Signal-Commerce Motor Truck Co.—Neal and Parker Heads

DETROIT, MICH., July 8—Merging of the Signal Motor Truck Co., maker of the Signal line of trucks, and the Commerce Motor Car Co., manufacturer of the Commerce trucks, has been effected here. The new organization taking over these two properties is to be known as the Signal-Commerce Motor Truck Co., and it is incorporated under the laws of New York State with a capital stock of 600,000 shares of no par value. The proposition is to be underwritten by fourteen members of the Detroit Stock Exchange, and active in its management will be Thomas Neal, head of the present Signal concern, and W. E. Parker, who is the head of the Commerce company

To Concentrate Production

The capital of the Signal company was increased from $85,000 to $450,000 in January of this year, and by a stock dividend the Commerce company was also raised some time ago to $250,000 capital. It is planned to concentrate the production of a very complete line of trucks, ranging from light delivery types to heavy-duty vehicles, in the new plant of the Signal company, located on Commonwealth Avenue, this city, removing the Commerce manufacturing business from its present location on Mackie and Solvay Avenues.

These two truck manufacturers are strictly Detroit companies, their stock being largely held here. Each makes a range of models of different capacities, and their merger will eliminate a competition between them that was keen. Mr. Neal, at one time president of General Motors Co., later chairman of the board of directors of that organization, and now one of its vice-presidents, is to direct the policies of the Signal-Commerce concern as chairman of the board. Among the directors will be W. E. Parker, who is also connected with the Mexican Crude Rubber Co.; Myron Neal of the Acme White Lead & Color Works, A. H. Buhl, T. J. Bosquette and W. K. Hoagland. There are also several other prominent automobile men interested whose names have not been disclosed.

Stock at $6

To give some idea of the amount of money involved, it is understood that the stock will be offered for subscripton at about $6 per share.

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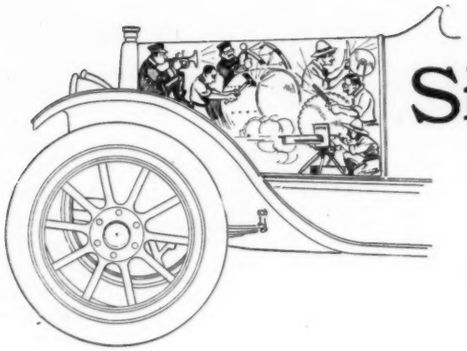
(*Trade News continued on pages* 77-84)



Silence=Continuous Noise

Over 200,000 Sounds Each Minute in a Twelve-Cylinder Car at 20 M.P.H.—Careful Design and Exquisite Workmanship Blend These Into a Pleasant Hum

By A. Ludlow Clayden

FOR the quietness of the modern automobile engineers have hardly received the credit that is properly their due; the immense difficulties with which they have had to contend only appear on a close examination. Some interesting figures can be obtained by calculating the number of opportunities for noise production that exist in a chassis, and the comparative frequency of each gives an opportunity for some "noise analyses" which are instructive.

Just to take a few striking cases, in order to show the idea. Suppose a twelve-cylinder chassis geared between four and five to one on high and running at twenty miles an hour with 34-in. tires. Using round figures we know that the engine fires six times in each crankshaft revolution, that the road wheel revolves 247 times per minute and if the gear is 4 5/11 to 1 the crankshaft revolutions per minute will be just about 1100. To simplify the argument, suppose it is 1000 r.p.m. Then the number of explosions per minute will be 6000 or no less than 100 per second.

400 Valve Shocks per Second

Taking a further step, each valve is opened and closed once to each explosion; so at a rate of 100 explosions per second there are 200 valve-lifting motions performed and 200 valve closings. The crankshaft revolves twice to each explosion and the piston makes four complete strokes, hence the 100 explosions per second represent 400 piston strokes in the different cylinders. Meanwhile the breaker mechanism must operate the contacts in the ignition device 100 times. If a chain front end is used the crankshaft sprocket will have about twenty teeth and will revolve 1000 times in the minute, so there will be 20,000 engagements of chain link with sprocket tooth on the crankshaft pinion; on the camshaft sprocket, and on any other intermediate pinion an equal number of contacts must take place.

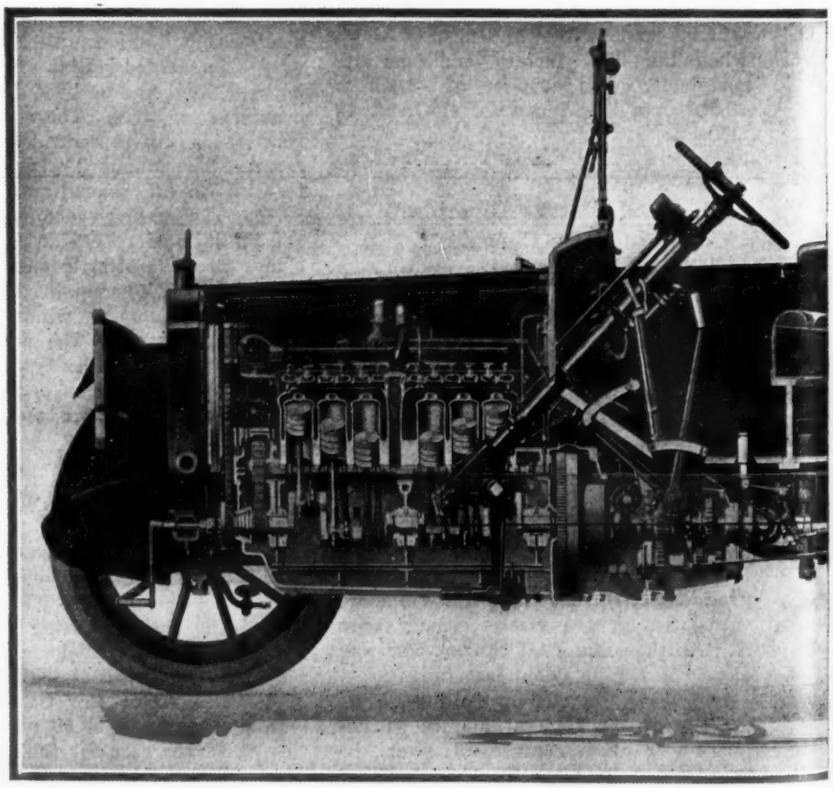
Thus, neglecting any other parts in addition to those mentioned, with a twelve-cylinder car running at 20 m.p.h. there are 2000 things happening every second which have possibilities for noise production; and each minute there will be 120,000.

Engine Makes 150,000 Sounds per Minute

Of course, what happens is that each minute sound blends with the others, so that the resulting sound is practically continuous and capable of being described as a low hum. Even today the predominant sound is almost always that of the escaping exhaust gases and, at certain speeds, the hiss of the air entering the carbureter.

There are many other small joints and connections on the engine which might be included. The generator brushes make and break contact on the commutator bars, the gears in the oil pump can be heard if you run the pump alone in a quiet room, there is probably a bevel geared head for the ignition which runs at a fairly high speed and so on. Altogether it is not too much to say that a twelve-cylinder engine at 20 m.p.h. performs 150,000 operations per minute, each of which could make an audible noise if it were not for the care taken to prevent it. And that engine is comparable with a water tank with 150,000 holes in the bottom, each closed by a cork of clever design and fine workmanship. Any falling off in quality of work means a loose cork and a leaking noise. As for instance a single loose lifter in the valve gear is instantly noticeable as a steady tap, tap, tap.

But, though the engine perhaps contains the greatest possibilities for noise making it is by no means all. In the gearset, in the rear axle, in the universals and in every bearing there is opportunity for sound production. To do a little more rough calculation let us consider the constant mesh gears in the gearset, one of the most troublesome parts from



This section of a twelve-cylinder Packard chassis shows most of the parts men
However, sufficient appear to emphasize the immense amount of engineering
ness of this and other

a noise viewpoint, though one which the average user never thinks about. Suppose there are twenty teeth on the pinion of the constant mesh gear pair, which is about the normal number. Then, since our engine is running at 1000 r.p.m. there will be 20,000 tooth contacts per minute.

Next, take the countershaft. This runs more slowly, say half the speed of the main shaft, and it drives the reverse pinion. Suppose there are sixteen teeth in the reverse pinion which is about as small as it could well be, then there will be 500 times sixteen or 8000 tooth contacts at this point.

Following the gear train through, the next step is the bevel drive of the rear axle. About as small a number of teeth as the pinion is likely to have is thirteen, twelve being the irreducible minimum. Thirteen teeth at 1000 r.p.m. means 13,000 contacts a minute and adding the contacts of teeth in the gearset we get a total of gear tooth contacts per minute of 41,000.

SOUNDS PER MINUTE MADE BY ALL PARTS OF TWELVE-CYLINDER CAR AT 20 M.P.H.

Explosions	6,000
Valves and tappets	24,000
Reversing piston direction	24,000
Breaker mechanism	6,000
Timing gear	60,000
Gearset and bevel drive	41,000
Bearings throughout car	56,000
Total	217,000

Bearings Create Noise

Another fruitful source of an audible, though quite a pleasant sound, is ball bearings. Each bearing contains a number of balls that carry the load when they are on one side of the shaft and have no load on them when on the opposite side. As each ball runs into the half where it is carrying the load it is compressed slightly; in other words it suffers a minute shock. Again, as it runs out of the loaded side into the half of the race where there is no pressure on it, it expands and thus creates another slight shock. Taking a very low estimate, this means that each ball bearing in the chassis, on the average, creates eight or ten tiny vibrations every revolution, roller bearings doing exactly the same thing, of course.

In the gearset there are two bearings at least on the mainshaft which make 1000 r.p.m. or a total of 16,000 shocks per minute. On the countershaft there will be another pair of bearings which run at half speed and so cause half the number of shocks or 8000, giving a total of 24,000 per minute for the gearset. In the rear axle there will be two races making 1000 a minute on the bevel pinion shaft, giving another 16,000 and the two bearings supporting the differential together with the two at the outer ends of the axle driveshafts will account for another 8000 shocks. This is figuring on a semi-floating axle, if it is floating another 4000 is to be added.

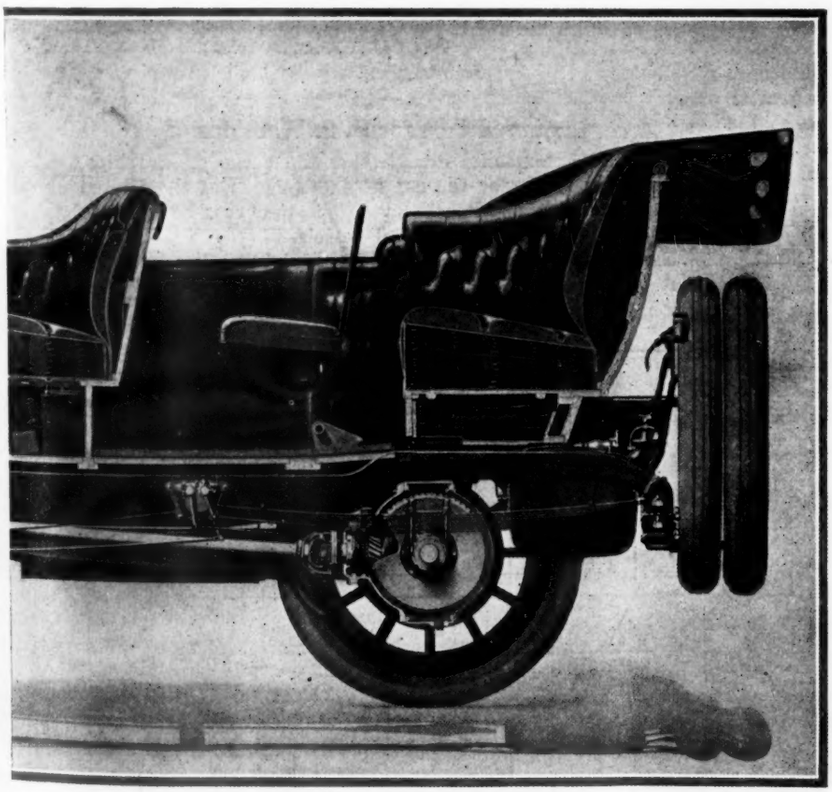
In the front wheels there will be at least four races of ball or roller bearings and these will cause another 8000 shocks between them. This completes the consideration of the principal parts of the chassis, with the exception of the universal joints, but as the stress on these is steady and does not vary in direction there is no reason why they should produce any sound, however small.

In the foregoing many other possible sources of sound have been neglected. For example there are probably gears to drive the speedometer, there may be ball bearings in the generator, there are ball thrust bearings which can make a sound if they are not perfect in manufacture and there are the engine auxiliaries already mentioned. One other thing which ought to be considered is the cooling fan which makes a hum by the action of its blades and also has to stand for at least 24,000 vibrations in the ball bearings which carry it, although, of course, like all other bearing variations, the amount of each is practically molecular in smallness.

Adding up all the sources of sound itemized we get the surprising total of 217,000 things which happen every minute, each of which taken individually is able to cause a sound. In an automobile running at 20 m.p.h. the hum which one hears is composed of *nearly a quarter of a million individual sounds.*

An experiment which may serve to illustrate what happens is to hold down the loud pedal of a piano and then to strike every note simultaneously. After the first crash has died away all the strings will be vibrating and a low sound will be heard that is a blend of all the chords and dischords of the keyboard. With the standard piano this is only a blend of eighty-four notes as compared with the 217,000 of the car.

Another rather interesting thought is that each of the 217,000 sounds taken alone, if they could be isolated, would produce a recognizable note. The smallest number of vibrations per second that is distinguishable as a steady note is sixteen, and this is said to be the pitch of the note made by a big bee. The middle C of a piano should give 512 vibrations per second, and the high C 1024 vibrations, while the highest pitch which any human ear can catch as a sound at all is 40,000 vibrations per second. In an automobile a definite note is to be avoided, and



tioned in the anaylsis of sound production. It does not show quite all of them. knowledge and of manufacturing skill which makes possible the extreme quiet high-grade chassis.

the reason that gears are such a particularly troublesome part to quiet is because they readily produce a note which is within the scale to which the ear is accustomed. For instance, as the middle C has 512 vibrations per second, this corresponds to a gear with twenty teeth running at 1536 r.p.m. Accuracy in workmanship can minimize the shock which occurs as each pair of teeth engage, and the use of large pitch, so as to reduce the number of vibrations per second by cutting down the number of teeth lowers the pitch of the note. A lower pitch not only is less irritating to the ear, but it blends more readily with the other sounds, hence the reason why coarse pitch gears often operate with such desirable quietness.

In the days when motoring was new S. F. Edge, of Napier fame, once said that there is in this world no such thing as silence, there is only continuity of noise. It is a succinct phrase and its truth is perhaps enhanced by the figures itemized above.

Determining Center of Gravity and Moment of Inertia

By Harry B. Wrigley

THE center of gravity and moment of inertia are properties well-known for common sections of beams, shafts, etc., but for other sections, as automobile axles, machine frames, rails, crane-hooks, etc., where the outline is such that the integration in the expressions for center of gravity and moment of inertia is difficult, the following graphic method will be found convenient.

Let it be required to locate an axis passing through the center of gravity of the axle shown in the figure.

Draw axes 1-1 and 2-2 at a convenient distance h apart, parallel to the required axis.

Draw any line as 3-3 parallel to 2-2 and project the points b-b on 2-2; from O and through the intersections on 2-2 draw straight lines intersecting 3-3 at b'-b'; continue this process by determining other points b'-b' and connect them to produce a transformed section.

The statical moment, M, of a plane surface with respect to an axis in the plane is equal to the sum of the products of the elementary areas and their distance from the axis considered, or, it is the product of the area of the plane surface and the distance of its center of gravity from the axis.

Measure the area of the original section and let A denote this area; also let d be the distance from 1-1 to the gravity axis; then by definition $M = Ad$. Measure the area of the transformed section $b' \ldots b'$ and let A_1 denote this area; then M, for the original section $= hA_1$, therefore $d = \frac{hA_1}{A}$, which will now be proved.

Let e denote the distance from axis O-Y to b;
e' the distance from axis O-Y to b';
ew an elementary area;
S the distance of ew from axis 1-1.

It will be noticed that $\frac{e}{h} = \frac{e'}{S}$,

hence $e = \frac{e'h}{S}$

By definition $M = ew.S \ldots\ldots + ew.S$
$= h(e'w \ldots\ldots + e'w)$
$= hA_1$

but $M = Ad$, therefore $d = \frac{hA_1}{A}$

To determine the moment of inertia of the section with respect to its gravity axis.

Project the points b'-b' on 2-2; from O and through the intersections on 2-2 draw straight lines intersecting 3-3 at b''-b'' and through these points construct a second transformed section.

The moment of inertia I of a plane surface with respect to any axis as 1-1 is the sum of the products obtained by multiplying the area of each element of the surface by the square of its distance from the axis.

The moment of inertia I of a plane surface with respect to any axis as 1-1 is equal to the moment of inertia I_g with respect to a parallel axis passing through the center of gravity of the surface plus the product of the area of the surface by the square of the distance between the axes; then $I = I_g + Ad^2$.

Measure the area of the transformed section $b'' \ldots b''$ and let A_2 denote this area, then for the original section $I = h^2A_2$, therefore $I_g = h^2A_2 - Ad^2$, the required moment of inertia.

Let e'' denote the distance from axis O-Y to b''.

Then $\frac{e'}{h} = \frac{e''}{S}$ and $e' = \frac{he''}{S}$; but $e' = \frac{es}{h}$ as before, hence

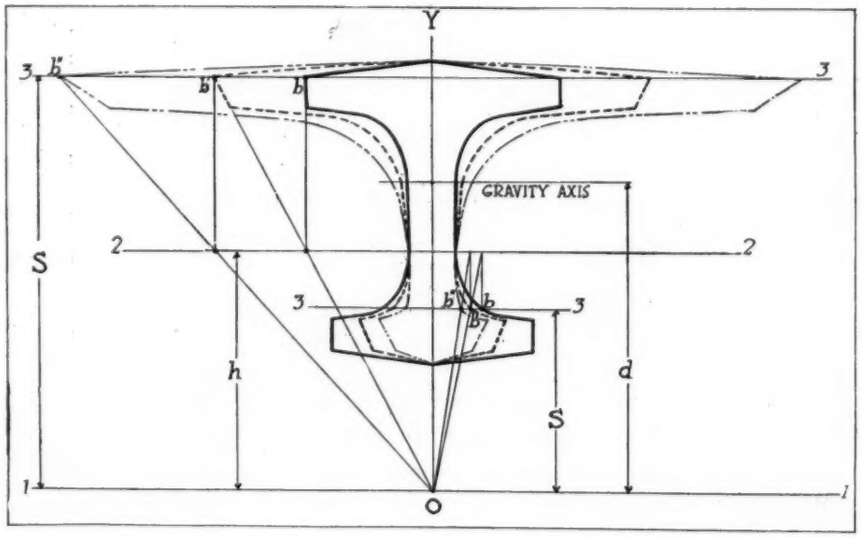
$S^2 = \frac{h^2e''}{e}$

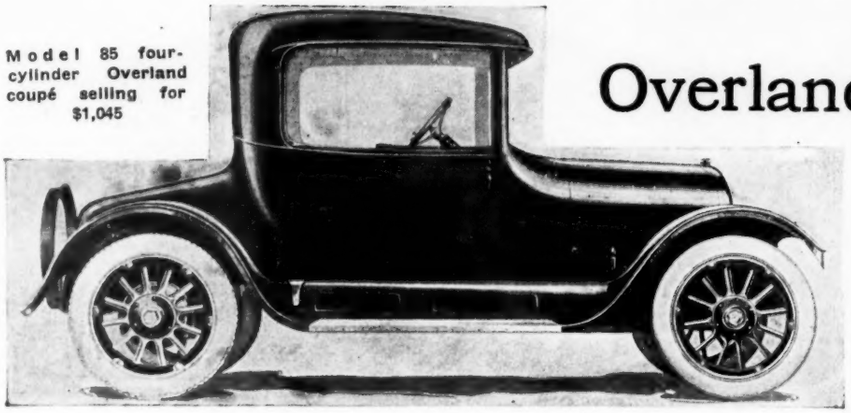
By definition $I = ew.S^2 \ldots\ldots + ew.S^2$
$= h^2 (e''w \ldots\ldots + e''w)$
$= h^2A_2$

Armored Cars for U. S. Warships

Armored automobiles cradeled on the decks of warships, in seagoing rafts, for the use of detachments of the United States marine corps in short operations, may soon be added to the regular equipment of naval vessels.

Experiments at the Boston navy yard have demonstrated that these cars can be stowed aboard by the means of electric cranes on war vessels in a few minutes.





Model 85 four-cylinder Overland coupé selling for $1,045

Overland Fits Battery Ignition

Small Four Little Changed—Model 83 Discontinued—New Model 85 as Four and Six

IN the 1917 models of Overland cars made by Willys-Overland company, Toledo, Ohio, it is easy to see that many of the features of the little four which appeared last November have proved so good that they are now seen on the whole range of models. For example, the pressed steel rear axle case used for the small car is now found on the larger one, and the same is true of the cantilever springs. Sizes, of course are different, but the designs are almost identical.

Present models are series 75-B, the little four, and series 85, either four or six. Model 83 is discontinued altogether. The small car sells for $635 as a touring car and $620 as a roadster, while the model 85 touring car is $795 as a four and $925 as a six.

Will Use Battery Ignition

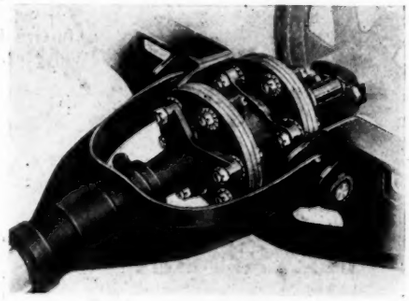
For the first time the Overland company will abandon magneto ignition for all its models. The new ignition incorporates a thermostatic throw-off arrangement, by means of which it is impossible to drain the battery through neglect to pull out the switch button. The current passing through the switch causes the temperature to rise in the thermostat, allowing it to bend and close an electric circuit, permitting the current to flow through a coil somewhat like a buzzer. This buzzer arrangement hammers on the switch button until it is thrown out, thus breaking the ignition circuit and preventing exhaustion of the battery.

Among other changes it will be observed that the gasoline tank has been moved to the rear and a new form of rigid tire support has been incorporated. On the six-cylinder car, spiral bevel gears are used for the rear axle, while on the four-cylinder model the rear axle gears have straight teeth. The use of a leather universal joint is another innovation.

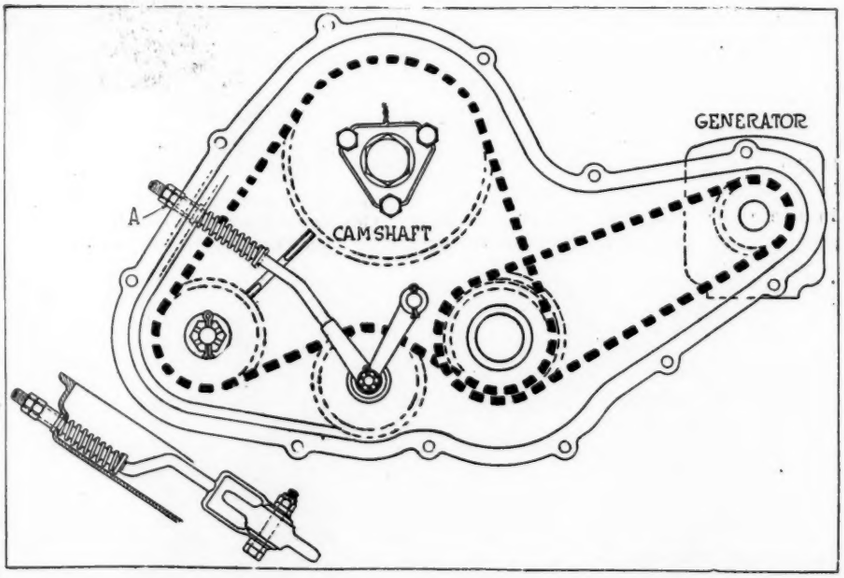
Probably the most outstanding feature of the model 85 Overland is the particular attention which has been paid to riding comfort. In relation to price both cars are quite long, the wheelbase of the four being 112 in. and of the six, 116 in. Both have large, comfortable bodies, with ample seating room for five persons. In addition to the improvements mentioned above, the seats in these new models have been built lower and deeper with a slight backward tilt to allow the passengers to relax slightly in the seats, and the seat cushions are built on deep coil springs which bear their share in the easy riding qualities of the car.

In the four-cylinder car, the power plant is a development of the four-cylinder engine which has now been used on over 300,000 Overland cars. It is of block design with a bore of 3¼ in. and a stroke of 4½ in. The manufacturers claim that it will readily develop 40 hp. The cylinders are iron castings and the pistons are also of cast iron. The piston length is 4 in., and the number of rings is two on this model. Connecting-rods are 8½ in. long and are of drop forged I-beam section. The crankshaft is carried on five main bearings and has a diameter of 1½ in. The engine is cooled on the thermo-syphon system, and one of the features of the engine is the large waterjacket space surrounding each cylinder.

The capacity of the radiator is increased by fitting of an auxiliary tank at the top, and the radiating surface is also augmented by corrugations in the thin vertical tubes of which it is com-



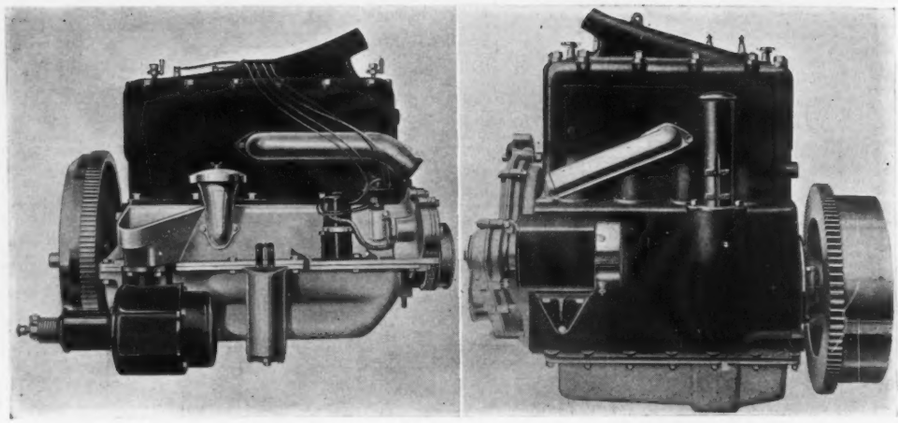
New universal used on model 85 Overland



In the Overland camshaft drive by silent chain the idler design has been changed. Formerly the idler was pulled against the chain by a spring, now the nut and lock nut A outside the timing case give a positive adjustment, the spring inside having only a limited cushioning effect

posed. A shell of pressed steel acts as a protective housing for the radiator tubes and this is made from a single piece of steel having no joints in the metal. The shell is supported in swivel seats which relieves the radiator from any stresses which would be due to racking of the frame.

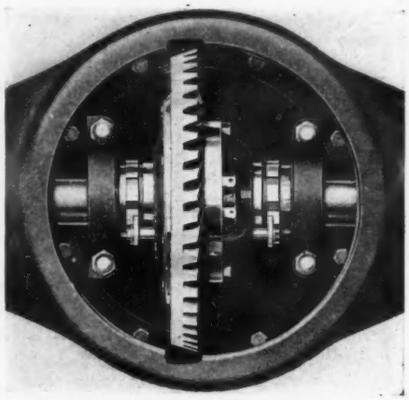
Splash-feed lubrication is used on the constant-level system in which the oil is continuously drained. A small gear oil pump located within the crankcase in a well at the rear end provides a steady flow of lubricant and also sends the oil through a revolving sight feed on the dash. The oil passes through the sight feed and returns to a lead which runs the length of the crankcase, supplying each of the troughs with a quantity of lubricant and keeping them constantly full. The overflow from the trough escapes back to the well in the crankcase, after which it is strained before again being circulated. The sight-feed indicator on the cowl dash clearly shows the flow of oil, for the oil in passing through it revolves a small fan-bladed wheel close to the glass face. There is also a float gage on the crankcase which indicates the amount of oil in the reservoir and the breather tube is widened at the top so as to also act as a filler opening.



Left—Engine of Overland 85-4, showing mounting of ignition distributer, starter and oil gage. Right—Engine of model 75-B, showing generator mounting and oil gage

Six and Four Alike

Other than in the power plant, the six-cylinder car is exactly the same as the four, except that the longer engine necessitates a longer hood and consequently a slightly longer wheelbase, the exact difference being 4 in. All this difference in length is made up at the front end of the car, necessitating, of course, a longer frame on the six than on the four. The six-cylinder engine is also a block design and is characterized by an extremely clean exterior. It has a bore of 3¼ in. and a stroke of 3½ in. It develops from 35 to 40 hp., according to the manufacturer's figures. The cylinder heads are removable and are cast in one piece, this construction giving great accessibility and also permitting accuracy in manufacture, particularly as regards the ability to machine all cylinders to a uniform size, thus having the effect of giving uniform compression in all cylinders. Throughout the engine is of conventional L-head design, with both the intake and exhaust manifolds on the right side, together with all the auxiliary apparatus, such as the water pump, ignition distributer, generator, starting motor, etc. The only parts mounted on the left side are the carbureter, the oil filler and the oil level gage.



Bevel gear assembly on model 85-6. Note the strong yet neat and efficient design without superfluous weight

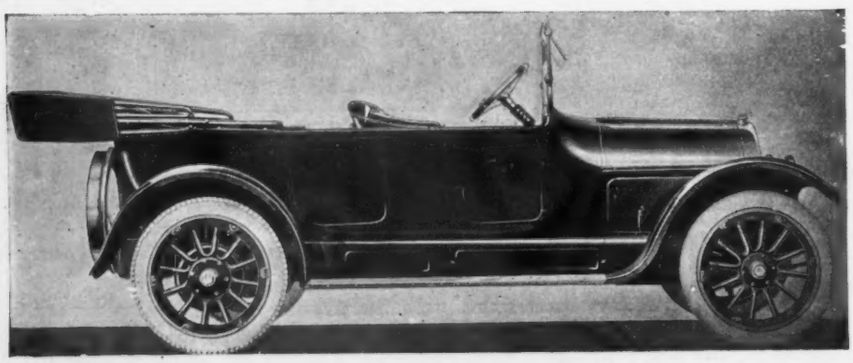
New top fastening on the model 85. This simple and positive device greatly simplifies top manipulation

The clutch is a leather-faced cone with three tension springs spaced evenly around, close to the rim. In releasing the clutch, six small spring studs press outward against the leather, raising it in spots, and when the clutch is engaged these raised spots touch first, providing a gradually increasing contract until the springs are fully depressed and the whole surface engaged. There is also a small fiber-faced clutch brake which stops the spinning clutch member and allows of easy gear shifting.

One Leather Universal

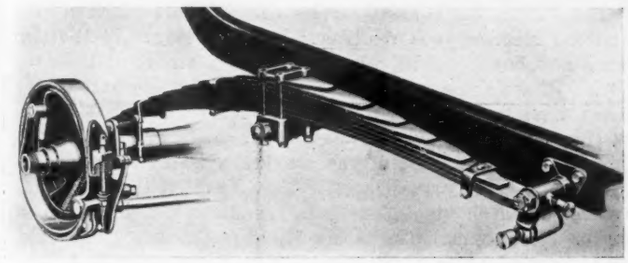
There is only one universal, this being the new leather design, since the gearbox is mounted in a unit with the rear axle. This gearbox provides three forward speeds and is made up of double heat-treated nickel steel gears of stub-tooth type. The shafts are carried on both roller and annular ball bearings. The rear axle is a floating type and as stated, on the four has straight teeth, while on the six it has spiral bevel teeth. There are four differential gears and the shafts are removable. The differential is carried on adjustable taper roller bearings, while the wheels are on annular ball bearings.

Two sets of brakes are used, the service set being contracting type, 13⅜ by 2¼ in. The emergency are expanding 13 by 2¼ in. Both sets



Overland 85-4 five-passenger touring car, which sells for $795

The cantilever springs used on model 75-B Overland are slung under the axle and the side members of the frame



On the 85 Overland, the rear cantilevers are mounted over the axle and at the sides of the frame members

operate on the rear wheel drums and are lined with asbestos fabric on woven brass wire core. The springs are semi-elliptic front, 36 by 1¾ in. and cantilever rear, 48 by 2¼ in. The wheels are wood, and the tires, 32 by 4 in., fitted with straight side tires and non-skids in the rear. On the touring sedan, mounted on the 85 chassis, the tires are 33 by 4½ in.; demountable rims are used throughout.

Bodies Last Word in Modernity

In the body work, the up-to-date conception of streamline design has been carried out through the entire line. The touring body is built with one-piece cowl and high-backed seat. The doors are hinged in front so that in case they are accidentally left open and strike an object they will be slammed shut instead of broken off. The doors are U-shaped, fitted with disappearing hinges and provided with large pockets, while the tool compartment is located under the front seat. Fenders are of heavy shaped steel and are crowned. The finish is Brewster green with ivory striping and the fittings are nickel and polished aluminum, while the fenders and other trimmings are black enamel.

Equipment Is Complete

The price of $925 for the six-cylinder and $795 for the four-cylinder touring car includes full equipment with Auto-Lite two-unit, 6-volt electric lighting and starting system; a complete set of lamps, dimmers and ammeter. There is also a speedometer and an oil pressure gage, complete tool equipment and an extra demountable rim. The top is a one-man mohair and the curtains are fastened from inside. The windshield is built in and incorporates both the rain vision and ventilating features. On this same chassis there is a touring sedan at $1,195 in four-cylinder, and $1,325 as a six, and a touring coupé at $1,045 and $1,175.

More Power in Small Four

The model 75-B is a new series which has taken the place of the previous small four-cylinder car. It is characterized particularly by a more powerful engine which is claimed to develop 31½ hp. at 1950 r.p.m., and to have a speed range of from 2½ to 53 m.p.h. on high. Another feature of the car is that it is equipped with 4-in. tires. It has cantilever suspension, two-unit, 6-volt lighting and starting and complete equipment. The body is new and is fitted with a one-piece cowl which slopes back in a graceful curve, preserving the characteristic Overland outlines.

Intake Manifold Cored in Casting

All four cylinders are cast in a block, having a bore of 3⅜ in. and a stroke of 5 in. and the combination of block casting with thermo-syphon cooling gives a very clean motor. The only auxiliary drive is that of the ignition distributer which is now used in place of a magneto and is mounted on the right side of the engine, back of the timing gear case. The valve mechanism drive is by silent chain and this drive also takes care of the distributer. The intake manifold is cored in the cylinder casting and delivers a warm mixture to the cylinders which is one of the factors in increasing the economy of the car.

Constant Level Splash Oiling

Lubrication is by constant level splash, the oil being circulated by a small pump which constantly maintains a supply of lubricant in the troughs beneath each cylinder. The clutch is the Overland type similar to that described for the model 85, having the three engaging springs with the auxiliary springs beneath the surface of the leather cone facing. The gearset is on the rear axle and is similar in design to that of the larger model, with three speeds and with nickel steel gears carried on shafts that are mounted on roller and annular ball bearings. The axle is floating and an unusual feature for such a low-priced car is that the differential is made up of four bevel gears. The axle shafts are removable and the bearing equipment is annular ball.

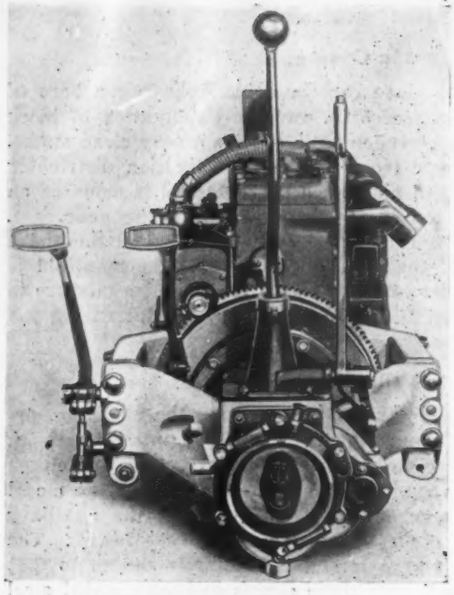
Fabrikoid Upholstery a Feature

Two sets of brakes are used, the surface being contracting 12⅜ by 1¾ in. and emergency 12 by 1¾ in. The springs are semi-elliptic, 36 by 1¾ in. with cantilever rear, 42 by 2 in. The tires are 31 by 4 in. mounted on artillery type twelvespoke wheels with demountable clincher rims. The bodies are streamline provided with Fabrikoid upholstery, front-hinged U-doors with large pockets and tool compartment beneath the rear seat. Heavy sheet steel crown fenders are fitted, and the finish is black and nickel and polished aluminum trimmings. The equipment is complete, including Auto-Lite starting and lighting, full set of lamps, ammeter, one-man Mohair top, inside fastening curtain, electric horn, combination tail light and license bracket, hinged robe rail, foot rest, tire carrier and extra demountable rim. There is also a full set of tools.

Instrument board of the 75-B Overland is compact and neat

Paige Makes Few Changes

Continues Models Seen at National Shows —Bodywork Has Been Improved, Giving More Room and Better Finish for 1917



Rear view of unit power plant used on Paige 6-38, showing control levers

AT the New York show last January a new model Paige known as the Fleetwood 6-38 appeared, this being an addition to the Fairfield model 6-46, which is a larger car. The 6-38 will be continued without any changes, but there have been a few alterations in the Fairfield model, mainly in connection with the body. The Paige-Detroit Motor Car Co., Detroit, Mich., has, like so many other manufacturers, found it necessary to raise its prices slightly, the smaller car now costing $1,090 as against $1,050 and the larger $1,375 as compared with $1,295. These prices are for five-passenger or roadster on the small chassis and seven-passenger or roadster on the larger six.

The changes in the 6-46 are not radical, but incorporate a few body alterations of importance and one mechanical difference. The body changes are a sloping windshield, instead of the vertical type formerly employed; a new form of upholstering in which the leather is arranged in piping, giving a long, tufted effect. Better springs are also used in the upholstery and these tend to make the car easier riding. Leather door flaps have been added and, in addition, there have been some improvements in the equipment in the form of a Boyce Moto-Meter, a vertical tire carrier in place of the slanting one on the previous car and a mahogany instrument board. A feature is made of the oversize tire equipment on this car and the color has been changed to Brewster green with ivory white wheels and black bonnet.

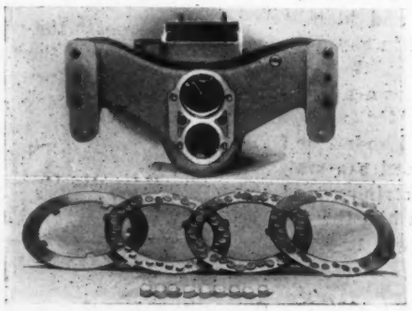
Has Gearbox Tire Pump

The only mechanical change is the addition of a single cylinder tire pump which is mounted on the gearbox and driven from the reverse idler pinion. This pump is a Stewart design and is arranged so that it is easily thrown into mesh by a lever projecting through the floorboard, and is of sufficient size to pump one of the 35 by 4½-in. tires the car uses in less than 5 min.

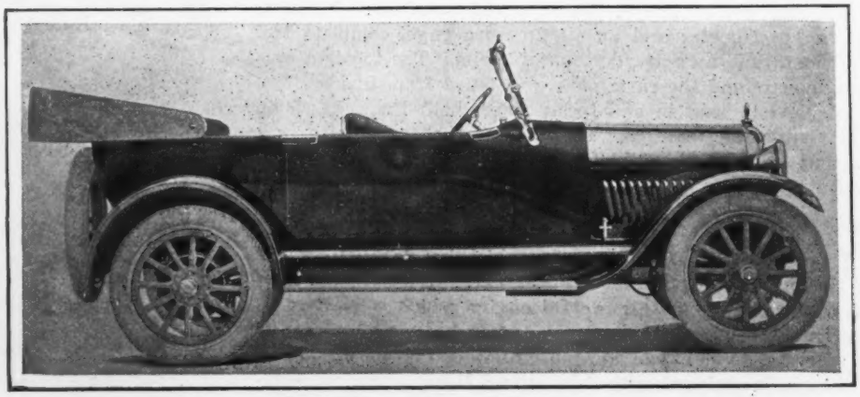
The Paige 6-46 chassis carries the Fairfield touring body and the Meadowbrook roadster. It is the larger of the two sixes and has a 124-in. wheelbase with a standard tread of 56 in. The engine is a block-cast 3½ by 5¼-in. unit power plant, having the clutch and gearset integral. The cylinder casting is of gray iron, while the crankcase proper is aluminum, the lower half of the crankcase which incorporates the oil pan being pressed steel. Valves are on the right and are composite, having nickel steel heads welded to 0.20-0.30 carbon steel stems. The entire valve mechanism is inclosed by aluminum cover plates, and the working parts are submerged in oil. With the aluminum covers and the block casting, a very simple exterior appearance is given the engine while, at the same time, the plates are removable and give easy access to the valve adjustments.

The crankshaft is a drop forging of alloy steel and every shaft is balanced individually for both running and static balance. The shaft diameter is 2¼ in. and three bearings are used for its support. The camshaft is also a carbon steel drop forging, having the cams integral with the wearing surfaces hardened and ground. The camshaft is carried in three die-cast bearings. In both the crankshaft and camshaft the bearing diameters are liberal, as are also the lengths. The crankshaft main bearings have the following dimensions: front, 2 3/16 in. diameter, 3 5/32 in. length; center, 2 7/32 in. by 2½ in.; rear, 2¼ in. by 3 9/32 in. The camshaft bearings measure: front, 2 17/64 in. diameter by 1 11/16 in. length; center, 2¼ in. by 1⅛ in., and rear, 2 7/32 in. by 1¾ in.

Drop forged, heat treated, I-beam connecting-rods are used of 0.35 carbon steel. The wristpin bearing has a diameter of 1 3/32 in. and a length of 1½ in., and the lower connecting-rod bearing has a 2 in. diameter and a 2 3/16 in. length. These rods, together with the pistons and the entire



Above—Massive aluminum gearbox. Below—Clutch disks in various stages



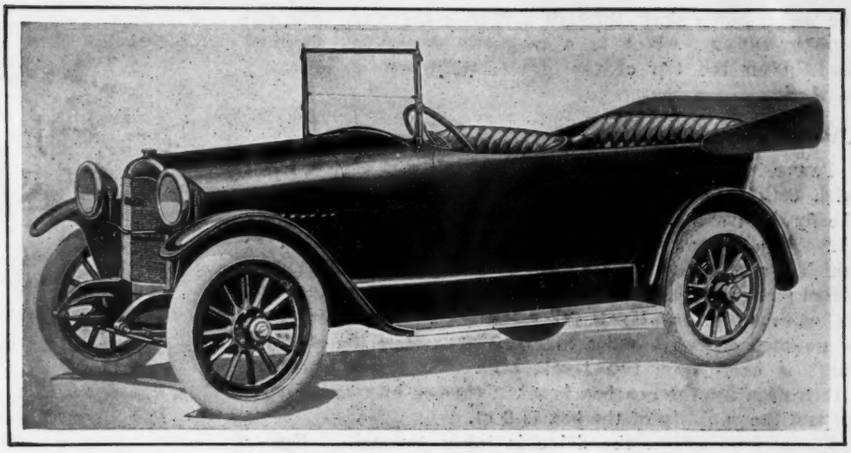
The Paige Fairfield model 6-46 seven-passenger touring car, which now sells for $1,375

reciprocating assembly, are balanced in sets, so that each complete assembly for a given engine must have a proper balance within very narrow limits.

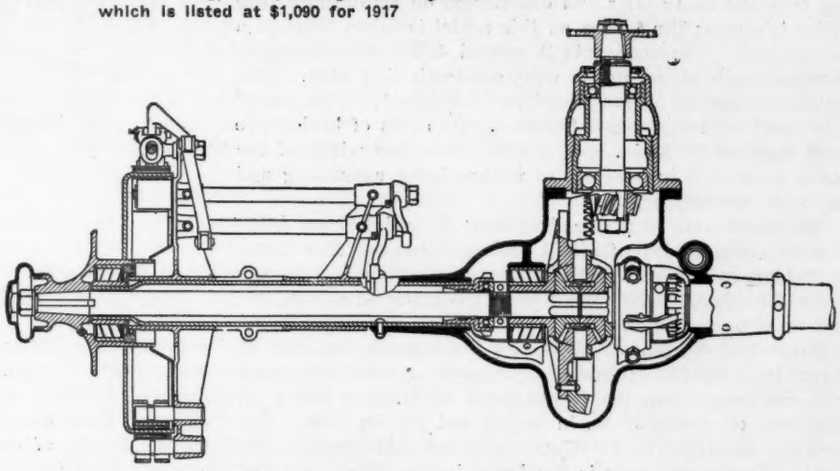
High Efficiency Sought

In carrying out the valve design particular attention has been paid to securing good volumetric efficiency at high speed. The diameter of the valve head is 1 11/16 in. and the opening of the port in the clear is 1 17/32 in. The valve lift is 5/16 in. The design of the valve is conventional with the 45 deg. seat, and the stem diameter is ⅜ in. The valve timing is also conventional, having the inlet opening at 10 deg. after top dead center with inlet closing at 28 deg. after bottom dead center. The exhaust valve opens 40 deg. before bottom center and closes 2½ deg. after top center. This leaves a 7½ deg. negative lap, during which time the piston descends a short distance on the suction stroke, allowing a vacuum to be created sufficient to overcome the inertia of the intake gases.

Lubrication is by a combined pressure and splash system. Oil is carried in the lower half of the crankcase, which has a capacity of 8 qt. A plunger pump operated from the camshaft forces the oil directly to each of the main bearings and to the helical timing gears. This gives four leads from the oil pumps as there are three main bearings and there is an independent lead to timing gears. Oil is forced through these leads in much greater quantity than is consumed by the main bearings, and the resulting overflow is allowed to pass into a series of splash troughs which are arranged one below each crank throw. The dip of the revolving cranks splashes enough oil to lubricate the remaining bearing surfaces, including pistons, cylinders, camshaft and cams.



Fleetwood model Paige five-passenger touring car, which is listed at $1,090 for 1917



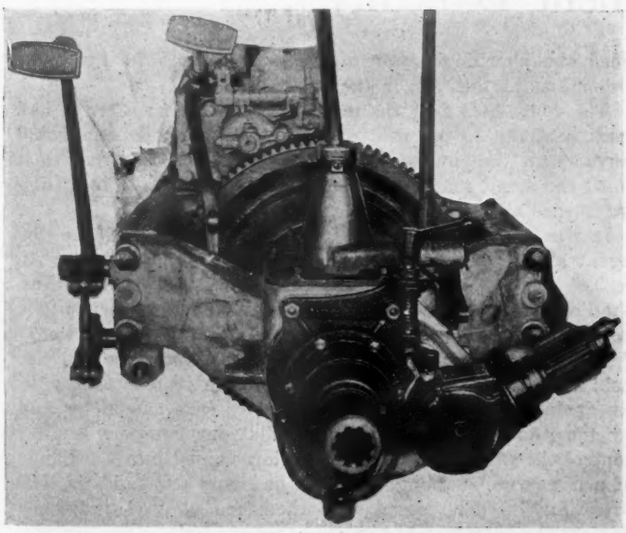
Section through the rear axle used on the Paige Fairfield six model for 1917

Cooling is by centrifugal pump which forces water to a zig-zag cellular radiator having a capacity of 7½ gal. Cooling is assisted by a ball-bearing four-bladed aeroplane type fan, which is hung from a casting directly on the front of the engine.

Gravity Gasoline Feed

The gasoline feed system is by gravity, the tank being located beneath the cowl and having a capacity of 14.7 gal. The carbureter is a Rayfield, supplied with both hot water jacket and hot air intake pipe. The exhaust manifold is located on the opposite side of the cylinder box from the carbureter and hence, in order to get the supply of hot air to the carbureter, it is necessary to carry it across the engine. This is done by fitting the hot air stove around the exhaust pipe and then carrying the hot air lead through the cylinder block between the third and fourth cylinders. Connection is made to the carbureter by a flexible tube on the opposite end of the passage. The hot air is thus provided directly from the exhaust manifold and is maintained at a high temperature by having it pass through the cylinder block where it comes in contact with the hot walls of the cylinder and also with the waterjacketing.

Electrically, the car is Gray & Davis as far as starting and lighting are concerned, while ignition is taken care of by the Remy high-tension distributer and Willard 6-volt storage battery. The starting and lighting system is a two-unit design with a series wound motor, meshing with the flywheel ring gear by means of a Bendix drive and a shunt wound generator on the right side of the engine, driven directly off



Mounting of the new power tire pump on the gearbox of the Paige Fairfield model for 1917

the water pump shaft through a flexible coupling. The automatic cut-out, which is a magnetic design, is mounted directly on the top of the generator, where it is easily reached.

Clutch Runs in Oil

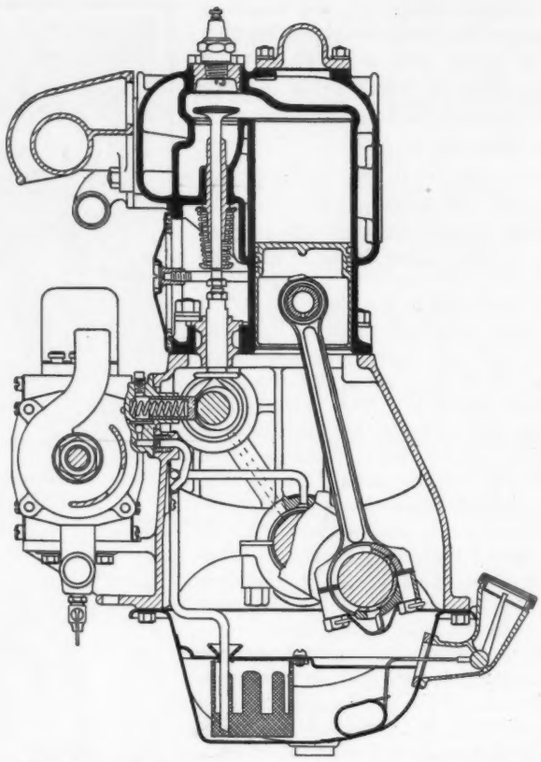
Power is transmitted through a multiple disk clutch, fitted with cork inserts, the entire clutch being inclosed within the flywheel and running in oil. The drive is carried back through a three-speed gearbox having an aluminum case which is a unit with the crankcase. The gears are of chrome nickel steel, hardened and ground, and the shafts are carried on both annular and Hyatt roller bearings. The main shaft is mounted on two annular ball bearings, while the countershaft is carried on two Hyatt high duty roller bearings. Lubrication for the gearbox is taken care of by transmission oil and the capacity of the box is 2 qt.

From the gearbox the drive is taken through a Spicer universal joint to the rear axle. This is a floating type having both the axle shafts and differential on Hyatt high duty roller bearings; the torque on this model is taken through a torque arm. The rear axle is geared 4.357 to 1, having a fourteen-tooth pinion and a sixty-one-tooth ring gear. This gives a reduction on low speed of 14.157 to 1, on second of 7.189 to 1, and reverse, 18.876 to 1. Two sets of brakes are used, working on 14-in. steel drums. The face width of the brake tooth is 2 in., one set of brakes being expanding and the other set contracting.

The front axle is a one-piece drop forged I-beam, heat-treated and provided with ball bearing spindles. The frame is of high carbon steel, channel section, having a 4-in. web and a 3-in. flange: the thickness of the material is 5/32 in., and it is narrowed in front to permit of a small turning radius, while at the rear there is a kick-up over the axle to reduce the height of the body. Springs are semi-elliptic front with cantilever rear, the fronts being 36 in. long and 2 in. wide, and the rears 48 in. in length and 2½ in. wide. The tires are Goodyear or Firestone, with non-skid tread on the rear. The steering gear is the Jacox irreversible screw and split sleeve type, adjustable for wear in any direction, with a steering wheel 18 in. in diameter in one piece, and made with a corrugated inner edge. The horn button is in the center of the steering wheel.

In bodywork, as noted, the cars have been very much improved, especially as regards fitting. The touring bodies are particularly roomy and easily carry a seven-passenger load. Some of the body measurements which are pertinent are as follows: front compartment from back of seat to toe board, 40 in.; height of cushion from floor, 13 in.; depth of seat cushion, 17 in.; width of seat, 47 in. and length of front compartment, 42 in.

The rear compartment measures from the back of the seat to the back of the auxiliary seat, 26 in., height of cushion from floor, 16 in.; depth of seat cushion, 19 in.; width of seat cushions, 48 in.



Transverse section through the engine of the new Paige

A Deferred Payment Difficulty

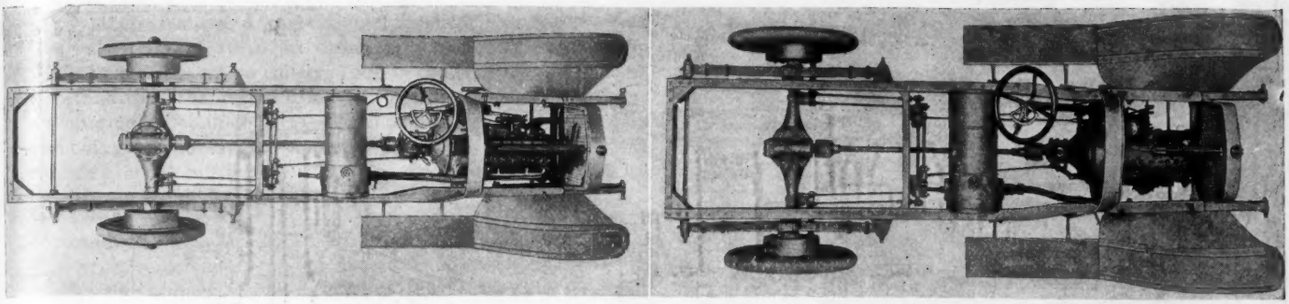
THAT an automobile manufacturer may retain title in an automobile even though he has received the whole amount under a sale contract, is the decision in a recent New York case.

The manufacturer had an agreement in writing with its agent in the city of Elmira, which contract was styled a "Limited Agency Contract." Under it the agent agreed not to sell automobiles for less than their list price; that he would advance in cash the sum of 85 per cent of the full advertised list price of each automobile at the time of its consignment to him; that his commission should be 15 per cent of the full advertised list price, to be paid by the company after payment of the full purchase price by the purchaser, and many other stipulations were contained in the contract.

In 1913 the agent sold a car and took from the buyer what was styled a "buyer's order and agreement." This was approved by the company and it was agreed that the car was to be paid for in monthly payments of $50 each. Thereafter the car was levied upon by a sheriff, who sold it under an execution issued on a judgment obtained against the purchaser. As the agent had forbade the sale of the car, he sued the sheriff to recover the sum of $195.70 which he claimed as his interest in the automobile.

The court held that the motor company, even after it had been paid the 85 per cent of the list price of the car, could have taken the car from its agent, as it held the title to it until the agent and the person to whom he sold it had fully performed their agreements.

It was further held that the cars were not sold to the agent at 85 per cent of the list price under the agreement, as the company restricted the sale of its cars at less than the list price and that such a contract was not against public policy under the decision of Ford Motor Co. vs. International Automobile League, 209 Federal 235, as that case did not hold that the company could not enforce its contract with its agents and fix a price at which its cars should be sold by them to users, but only held that the company cannot control the price of a car after it has passed into the hands of a user who has bought it from an agent and paid the full price for it. The agent was therefore allowed judgment against the sheriff on the ground that the title to the car was in the company until it assigned it to the agent. (Whitney vs. Biggs, 155 N. Y. S. (New York) 1107.)



The two Day-Elder chassis in plain view. The Senior model appears at the left and the Junior at the right

Two Worm-Drive Day-Elder Trucks

Junior and Senior of Conventional Design—No Governor

PRACTICALLY the same structural features characterize two truck models which the Day-Elder Motors Co., Newark, N. J., is now producing. They are rated at 1250 and 2000 lb. capacity, known respectively as the D-E Junior and Senior trucks. Both are conventional designs, with rather low, rakish lines, Hotchkiss drive through worm gears and unit power plant assembly.

An outstanding feature is that both models are without governors, the smaller one being mounted on pneumatic tires and especially designed for fast delivery work, and the larger with solid tires. Both have small, high-speed motors, which should show economy in ordinary work, and yet, being of the high-speed type, they are able to develop higher power than if they were governed. In each model the engine is incorporated with the clutch and gearbox and suspended on three points, final drive being by single shafts with two universals each.

On the Junior model the Le Roi motor is used and on the Senior, a Continental. Both are block-cast with valves to the right and both have thermo-syphon cooling through square-tube vertical radiators in sheet-metal cases. Single high-tension ignition with hand spark advance is used on each model, both having Dixie magnetos. A Schebler carbureter is used on the Junior model and a Zenith on the Senior.

Left Steer and Center Control

Brakes are all on the rear wheels, consisting of side-by-side internal types, with rocking equalizers. Left steer and central levers are common to both models, Gemmer steering gears being used. Jones wheels are employed, the pneumatic-tired ones on the smaller model having demountable rims.

The Stewart vacuum system of gasoline feed is used, fed from cylindrical tank beneath the seat on each model.

Clutches and gearsets on both models are the products of the Detroit Gear & Machine Co., and comprise dry-disk clutches and three-speed selective gearsets. The shafts and universals are of Hartford make, driving Sheldon worm-driven axles. Both torque and propulsion are taken by the springs.

Prices as quoted in the specification table below apply to the stripped chasis only, including the driver's cab. Electric starting and lighting will be installed for an additional charge of $85, including the lamps. Standard bodies are carried in stock and will be applied at extra cost or the chassis will be sold without bodies.

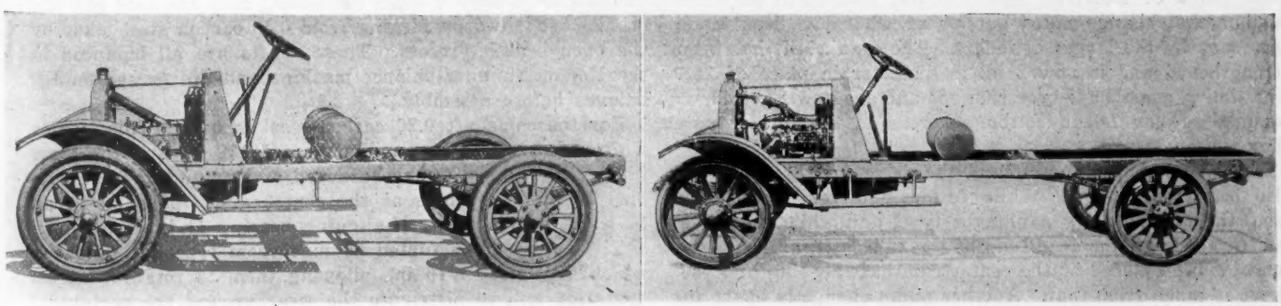
In appearance the trucks are pleasing, the radiators being located well back on the frame in both models, behind the front axle in each case.

	Junior	Senior
Capacity, lb	1250	2000
Price	$875	$1,450
Wheelbase	108	128
Tires, front	33 x 4	34 x 3½
Rear	33 x 4	34 x 4
Bore	3⅛	3½
Stroke	4½	5
Formula, hp	15.64	19.61
Speed, r.p.m.		
M.p.h.	42	35
Gear-ratio in high gear	6.5–1	7.8
Final drive	Worm	Worm

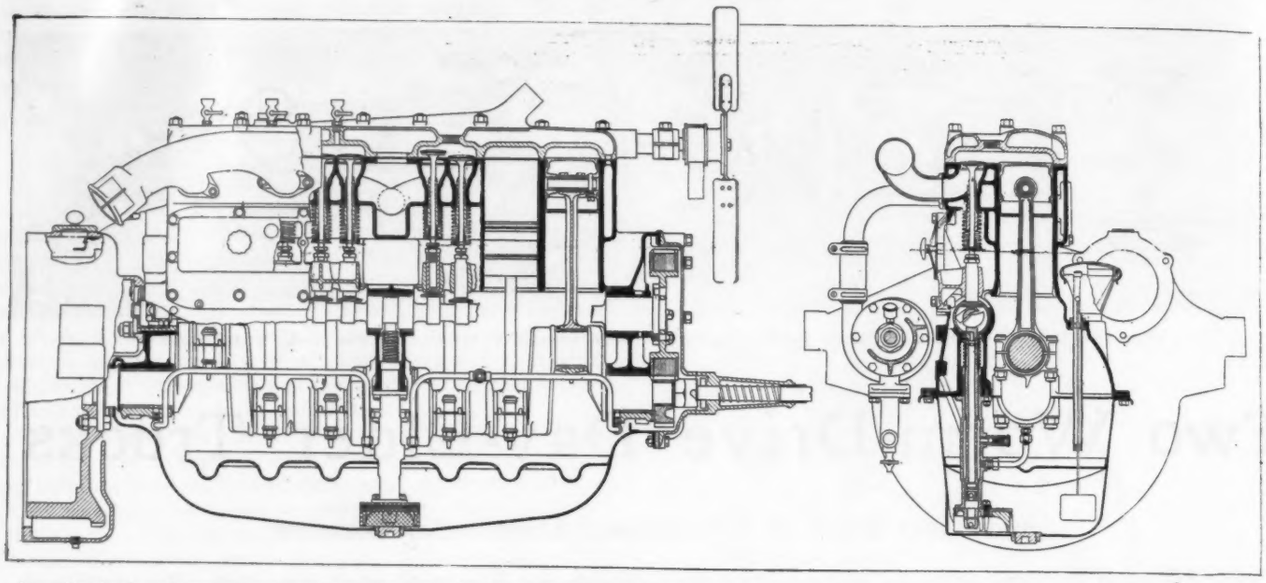
Some Simple Air Bag Precautions

A SUCCESSFUL western vulcanizer has found that he can save a great deal of money in the course of a year simply by being careful with his air bags.

The shape and inside dimensions of a Q. D. clincher tire are different from a straight side tire, so this vulcanizer has two sets of air bags, one for each type of tire. Tires of the same type but of different makes also vary in their dimensions but of course it would not be practical to have a different set of air bags for every brand of tires. To get around this difficulty the vulcanizer has pads of various sizes. —*Goodyear Tire News.*



Similarity of design marks the Day-Elder models. The Junior is at the left and Senior at the right



Longitudinal and transverse sections through the six-cylinder model 25 Rutenber engine. It has a bore of 3⅛ and a stroke of 5 in.

Rutenber Engines Made in Four Models

Two Are for Passenger Cars and Two for Trucks

RUTENBER engines, made by the Rutenber Motor Co., Marion, Ind., are made in four models. Two of these are for passenger cars and two for commercial vehicles. The bulk of manufacture in the plant is, however, given over to the model 25, which is used in the Paige, Auburn, Marion, Glide, Madison, Halliday, Roamer and Jones cars for the coming year.

This motor is a successor to the model 22 of last year and has been refined and rendered more powerful by an increase in the bore. In general design, however, it is very little different from its predecessor, what changes there are being due to the enlarged cylinder dimensions and in detail refinements. It is a six-cylinder L-head 3⅛ by 5 in.

The other passenger car engine is known as the model T. It is used in the Inter-State cars and is a four-cylinder, valve-in-the-head job, the dimensions being 3½ by 5 in.

Production on the truck models is limited by the fact that nearly all the facilities of the plant are required for the model twenty-five passenger car engines. The two truck models are fours and the entire consumption is taken by the Indiana Truck Co. The motors are known as the 38 and the 20 with dimensions respectively of 4⅛ by 5½ and 3½ by 5. They are standard L-head designs.

Crankshaft Is Larger

Regarding the improvements on the model 25, which is the focal point of Rutenber manufacture, there will be little fundamental change noted outside of what has been made necessary by the larger cylinders. The crankshaft has been strengthened and is now 2 in. in diameter in place of 1¾. The timing gears have been changed and are now Fabroid, or compressed Sea Island cotton, whereas in the former unit they were cast iron.

The oil pump is different and the drive for this unit has also been rearranged. While formerly a vein pump was used, the pump is now a plunger type, and while the drive was formerly off the front end of the camshaft, an eccentric has now been placed at the center camshaft bearing and the drive is taken from that. Another pump change is in the instrument for circulating the cooling water. This was formerly a separate casting bolted on to the crankcase. It is now contained directly in the case and a timing drive is fitted to it, to take the standard Remy units.

The fan pulley unit has been brought forward, allowing of a stiffer and thicker timing case. In the matter of motor fittings the engine is adapted to take any of the standard products. The flanges are so arranged that they can handle both vertical and horizontal installations.

All the makers who have previously been using the Rutenber model 22 and are continuing with the Rutenber product have shifted to the 25 without rendering necessary any important chassis changes. This makes the third successive year, practically, for this type of motor with the Rutenber concern. It is a six-cylinder four-cycle L-head design with the cylinders and the upper half of the crankcase cast together. Following up-to-date practice, the valves are inclosed and the cylinder heads are detachable. It is for unit or separate power plant construction designed for three-point suspension and having the flywheel bell housing as a detachable unit from the remainder of the engine.

The pistons are cast iron and are fitted with three rings. Two of these are close to the top and the third is located just beneath the wristpin boss, giving wide separation between the rings and reducing to a minimum the tendency toward slap. The wristpin is locked securely in the boss by a through set screw. I-beam connecting-rods are used and the crankshaft is a drop forging from 0.40 carbon steel made by the open hearth process. These shafts are all balanced in the Norton running balance machine and are passed on for balance before assembly.

For the camshaft 0.20 carbon steel is used. This is also a drop forging having a diameter of 1⅛ in. and the cams integral. The shafts are hardened and ground and are carried in plain bearings at the center and front and in an S. K. F. double-row, self-aligning bearing at the rear end.

The valves are actuated by mushroom type flat followers which are offset 1/16 in., allowing them to rotate while in operation and to distribute the wear around the peripheral

bearing surface. The valves are made in two parts with alloy steel stems and carbon steel heads. The diameter of the valves is 1 5/16 in. in the clear and the lift is 5/16 in. A feature of the valve construction is that the valve brackets, together with the entire lifter mechanism, can be lifted from the engine without disturbing the camshaft. This is done by removing the coverplate and stud nuts and then turning the starting crank until the valves are at their lowest level.

Standard Timing Used

Standard valve timing is used, and is in accordance with the practice on many of the latest American engines. The intake valve opens at 15 deg. after top center and closes 50 deg. after bottom center. The exhaust valve opens at 45 deg. before bottom center and closes 10 deg. after top center. Compression in 75 lb. absolute.

Provisions for Standard Electric Systems

Any standard starting and lighting unit can be employed with this engine. The flywheel ring gear as standard is cut with 126 teeth on an 8-10 pitch. The flywheel will fit any standard size clutch and the entire design is one which will fit in with the standardized chassis parts furnished by makers of clutches, gearsets, etc. An ignition distributer drive is mounted on the engine and can be used when desired.

Pressure and Splash Oiling

Combination pressure and splash feed is used for lubrication. The oil reservoir is in the bottom pan and has a capacity for 1½ gal. It is taken from the crankcase reservoir by the plunger pump, which, as has been explained, is driven by an eccentric off the camshaft. There are direct leads from the pump to the main bearings which thus receive a supply of oil under pressure. The other leads go direct to the crankcase where the oil is led to splash troughs placed beneath each connecting-rod throw. Provision is made for the mounting of an oil pressure gage and the pressure may be regulated by means of an adjustable relief valve. Some of the specifications of the model 25 engine follow:

Cylinders	Six
Bore	3⅛ in.
Stroke	5 in.
Valve diameter	1 5/16 in.
Piston length	3¼ in.
Piston pin bearing	¾ by 1½ in.
Connecting-rod length	9½ in. center to center
Connecting-rod bearings	Front, 2 by 2¾ in.
Connecting-rod bearings	Center, 2 by 2¾ in.
Connecting-rod bearings	Rear, 2 by 3⅛ in.
Camshaft diameter	1⅝ in.
Camshaft bearings	Front, 1 15/16 by 2¾
Camshaft bearings	Center, 1 29/32 by 2⅞
Camshaft bearings	Rear, S.K.F. No. 1265
Length, front of fan to rear of cylinder	32¾ in.

Jeffery Quads with Wrecking Equipment for Mexico

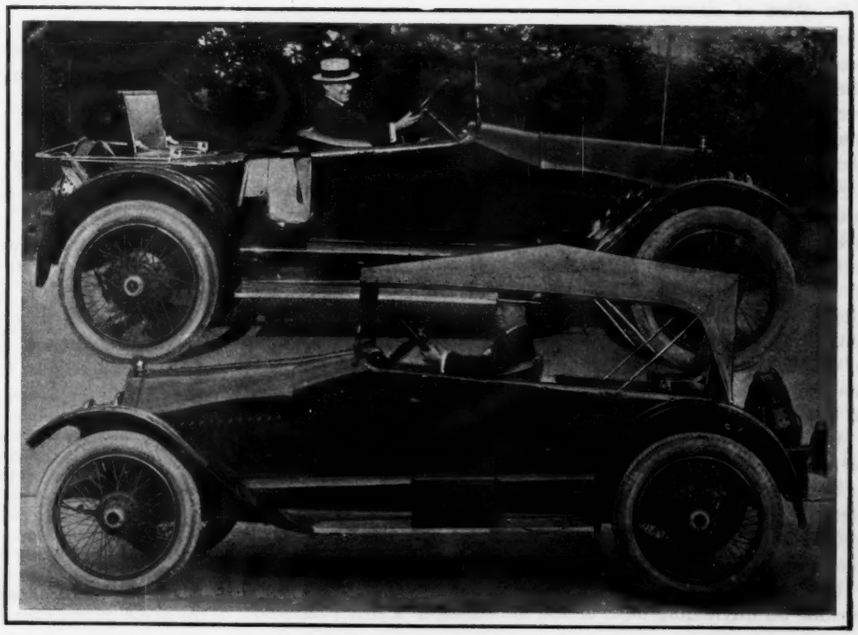
A POWER winch, with 300 ft. of steel wire cable and two capstan heads, is the feature of a new type of wrecking truck that will aid the motor truck trains in Mexico when they get into difficulties. Several of these are now on their way south, and others are being turned out by the Thomas B. Jeffery Co., Kenosha, Wis., as fast as possible, in anticipation of the rainy season in Mexico. The chassis employed is the Jeffery Quad, which drives, brakes and steers on all four wheels. About 200 Quads for various purposes are already in Mexico.

Body Is of Steel

The body of this truck is made of steel. It is 10 ft. long, 40 in. wide and 32 in. deep, and has wide running boards on both sides, strong enough to hold a considerable outside load. Besides the power winch and capstan heads, the truck carries 300 ft. of 9/16-in. wire cable, 100 ft. of 1¼-in. manila rope, an oxy-acetylene welding outfit complete with acetylene and oxygen tanks, flux rods and wire. There is also a hand-operated derrick for lifting heavy objects into and out of the truck, besides a workman's bench with vice and tools. The auxiliary equipment includes shovels, axes, crowbars, pick-axe, sledge hammers, gin pole, tow chain, wheel and flange pullers, clamps, files, and a Pyrene fire extinguisher.

A Special Five-Passenger Design On Mitchell Chassis

AT the right is illustrated a five-passenger roadster specially designed and built by the Carl H. Page Motors Co., New York City, agent for the Mitchell on which chassis the body is mounted. The rear portion can be closed entirely, thus converting the car into a two-passenger roadster while when opened it has ample room for five, the seats being large and comfortable, the fifth seat being formed by the door on the right-hand side which also serves as an entrance to the rear seats.



Top Disappears

As shown in the illustration the top is of distinctive construction, the top material being removable so that when the top is not in use the nickel-plated bows are folded down around the rear of the body, the material being compactly stowed away in a receptacle especially provided for it at the back of the body.

The Search for the Army Truck Wheel

(*Continued from July 6, pages 24-26*)

By Marius C. Krarup

SINCE the normal driving wheels of automobiles and motor trucks are the only working elements in them whose operation depends on friction, and particularly on friction with a road surface of uncertain and variable suitability for acting as the corresponding friction element, the examination of other types of wheel, with the idea of arriving at a preliminary idea of their properties in advance of actual tests or to decide if practical trial would be advisable, should be liable to save costly experiments sooner or later. In the case of the composite type of wheel—which might also be termed the "squirrel cage" or "treadmill" type, to suggest its mechanical nature more graphically—no such preliminary examination has appeared in public, while it is known that the type has been used in practice and has shown some very desirable qualities (especially in negotiating sandhills and ravines with heavy loads), but also that it has not survived and that probably, therefore, some sharp limitations of its utility have cropped out. The nature of these has not come to light, however, and they may have arisen from faulty application or design rather than from unavoidable defects in the principle.

In so much more as the cursory examination of the same type for front wheels and trailer wheels in THE AUTOMOBILE of June 22 indicated considerable merit for this mode of using it, the more intricate examination of its possibilities for driving wheels seems to be in line with the many efforts now being made, partly in connection with the European war and partly in the development of farm tractors, at finding a wheel type which will operate where normal wheels are unreliable. An examination of this kind may lead to practical trials or to rejection of the type. It can scarcely be sufficiently decisive and explicit to compel acceptance of its purely theoretical conclusions, as the subject is probably still more complicated in practice, but these should of course be as nearly correct as possible in the essentials.

Correction of Errors

As intimated in a note at the end of last week's instalment of this article, however, an error in the premises for the equations in it was scented by the writer too late for correction in that issue, which was then going to press. Subsequently another error was discovered, consisting in applying the gravitation formula for the time of the free fall, $t = \sqrt{2h:g}$ or, approximately, $t = \frac{1}{4}\sqrt{h}$, in connection with measurements expressed in inches, and this slip affected the figures materially. The safe maxim of not doing new work hurriedly was thus unfortunately vindicated, and the writer must ask readers to replace the matter from the first equation near the top on page 25 to the end on page 26 with a more correct version, as given in the following, the passages in small type being substantially repetitions explaining the method of reasoning and not materially affected by the errors in the details.

It was erroneously supposed that the factor p was needed to indicate the nature of the road, but more deliberate examination of the work of propulsion shows that, if traction resistance is uniform, p does not stand for anything that is not fully expressed in coefficient f. The equations should therefore be remodeled by eliminating p, or else giving it the value 1 unless the physical conditions under consideration include an unyielding obstruction imbedded in a soft road and it is the special object to determine how such an obstruction affects the propulsion. It is simpler to eliminate p in considering a uniform traction resistance and introduce it again only where it belongs.

In restating the case, Fig. 3 is reproduced for renewed reference herewith. For completeness, front wheel resistance is also included in the subject and the equations, while previously it was made an after-consideration.

Angle α represents the minimum advancement of Q necessary for producing vehicle movement through the turning of Y. The pressure of L at b balances under this supposition against the traction resistance. The latter is expressed by coefficient f as a percentage of the weight to be moved. When the application of power to Q holds this component of the wheel forward and in contact with the other component, Y, at b, the load L, acting vertically at this point tends to turn Y around the point of ground contact, A, the resistance being primarily $(L + W)\,f$; where W is the weight of Y. But, if the resistance to the simultaneous turning of the front wheel is included, and the load thereon is L_2 (including the weight of the wheel itself), the total resistance to be balanced by L acting at b is $(L + W + L_2)\,f$. As the movement to be effected is the (continuously repeated) turning of Y around A, the required action is analogous to that of a pair of scales with arms of unequal and variable length. The power acts with pressure L and the leverage $R \sin \alpha$. The weight to be moved may be considered as acting with an opposite leverage just sufficient to balance against this pressure, any increase of angle α causing movement. One has then

$$L\,R \sin \alpha = (L + W + L_2)\,f.$$

Whether the road is hard and smooth, in which case f becomes small, or it is soft, so that the wheel is imbedded in it to some depth, the value for f in each case expresses the degree of resistance caused by the road condition, and no additional factor is needed to express a road condition under which the wheel's contact with the ground extends more or less on both sides of A. A remains the pivot around which Y must turn progressively, so long as the traction resistance is not rendered irregular by unyielding, imbedded or projecting, substance.

To determine how large α must be, one has therefore

$$f = \frac{L\,R \sin \alpha}{L + W + L_2} \text{ and } R \sin \alpha = \frac{f\,(L + W + L_2)}{L}$$

As L_2 is rarely more than one fourth of L, and W is small, say 5 per cent of L, one has then, even if f is taken as high as 20 per cent and with $R = 15$ in.,

$$\sin \alpha = \frac{20 \times 1.30}{1500} = \frac{26}{1500} = 0.0173$$

making α a very small angle. Movement of the vehicle therefore begins on a level road, even if it is so sandy or soft as to raise f to 0.20, at a very small advancement of Q.

In the case of a steam vehicle or a gasoline motor truck with hydraulic transmission, these relations should be decisive to show that the composite driving wheel system will permit starting and operation at one speed or another. But for ordinary gasoline motor trucks the practical question relates to starting and running at the speed giving maximum torque for driving wheel Q, and this is the speed obtained on low gear with the motor running at normal speed. It may be 3 or 4 m.p.h. Let it be given as m m.p.h. vehicle speed. The question is then: At m m.p.h. what are the limit values for β and f? (β being the angle, larger than α, at which a desired vehicle speed is produced.)

To avoid considering the initial acceleration of the vehicle at the

start and the storing of kinetic energy, which is kept constant during running at uniform speed, the running conditions only are considered. This should be permissible, since it has been shown that a start at one speed or another is effected as soon as load L is rolled forward to contact b, even if f is very high.

The question of being able to apply the driving power to advantage now becomes that of deciding if the traction resistance encountered in moving the vehicle at m m.p.h. can be overcome for a given distance by the wheel action in the same length of time which the vehicle speed places at disposal. While vehicle advances the length of the arc AC at m m.p.h., can L fall the distance l which it must fall by reason of this vehicle movement and at the same time overcome the resistance to traction? Or can it fall even more rapidly?

It is noted that while the power is continually keeping Y in contact with Q at c and keeping β constant (under the supposition of uniform vehicle speed here contemplated), the gravitation of L takes place independently. The rotation of Q nullifies the actual drop of L by exactly offsetting it. The power thus raises L the height l, and this peculiar movement supplies power available for overcoming the traction resistance. If this power is superior to the traction resistance, acceleration takes place, but it is here the question of examining the conditions for uniform speed. Hence we use an equation expressing the driving action taking place in the same length of time as required for the corresponding vehicle movement.

L unrestrained would fall through height l in the time, in seconds, determined by formula $h = \frac{1}{2}\, g\, t^2$, from which is derived $t = \frac{1}{4}\, \sqrt{h}$, with the natural acceleration taken as 32 feet instead of 32.16, but in connection with the use of this formula all the inch measurements must be expressed by the foot unit.

The gravitation of L is not free, however, but retarded by the resistance of $\frac{f\ (L + W + L_2)}{R \sin \beta}$ in the ratio of its ratio to L. The equation to be used therefore becomes

$$t = \tfrac{1}{4}\ \sqrt{l} \times \tfrac{1}{4}\ \sqrt{l} \times \frac{f\ (L + W + L_2)}{L.\ R\ \sin\ \beta}$$

$$= \tfrac{1}{4}\ \sqrt{l} \times \frac{L.\ R \sin \beta + f\ (L + W + L_2)}{L\ R\ \sin\ \beta}$$

$$= \frac{2\ S\ \pi\ \beta}{360 \times m \times 1.466} \text{ second,}$$

where the left side represents the time in seconds for the gravitation of L through the height l and retarded by traction resistance, while the right side represents the time in seconds in which the vehicle moves the distance equal to the arc AC at the speed of m miles per hour. As 1.466 foot per second equals 1 mile per hour, m represents the number of miles per hour.

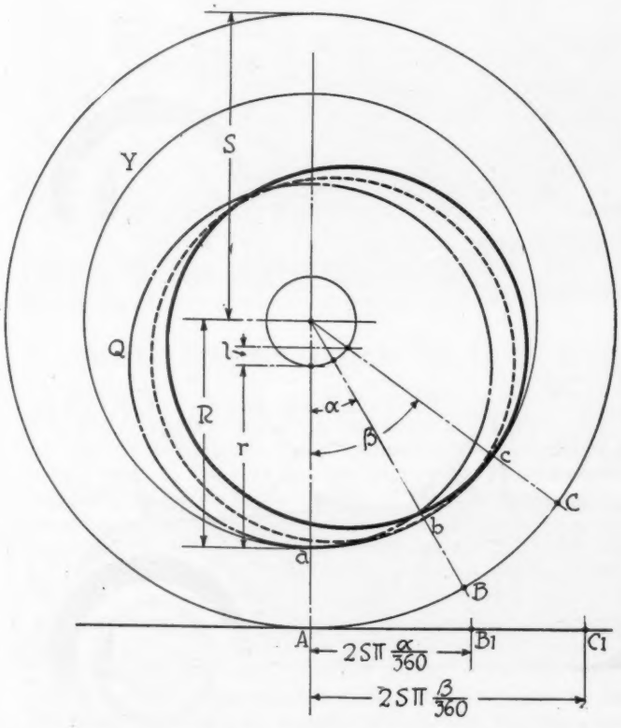


Fig. 3—Diagram illustrating factors which enter in the operation of composite wheel as traction wheel. R sin β is the perpendicular from c to Aa

If this equation gives a value for m that agrees with practical values for l, f, and β and with the vehicle speed at which a gasoline motor vehicle is best able to handle a heavy load on difficult roads, then a presumption seems to be established to the effect that the composite wheel system can be used but it must be shown thereafter that it has special advantages and can be used on hills.

The promising feature about it seems to be that the system handles the heavy load under certain fixed relations between Q and Y and thereafter engages the load to propel itself by gravitation, which action would seem to produce some independence of the size of the load for unusually bad road conditions.

Example in Figures

To try what the test equation shows, the following values may be used, for example: $S = 20'' = 1.66$ foot; $R = 15'' = 1.25$ foot; $r = 12'' = 1$ foot; $\beta = 45°$; $l = (R - r) \times (1 - \cos \beta) = 3'' - \frac{3''}{\sqrt{2}} = 3'' - 2.127'' = 0.873'' = 0.07275$ foot; $L = 1000$ lb.; $Y = 50$ lb.; $L_2 = 250$ lb.; $f = 0.20$.

These figures entered in the test equation give:

$$t = \tfrac{1}{4}\ \sqrt{0.07275} \times \frac{1000 \times 1.25 \sin 45° + 0.20\ (1000 + 50 + 250)}{1000 \times 1.25 \sin 45°}$$

$$= \frac{1.3108}{m \times 1.466} \text{second}$$

And by figuring further on left side, with $\sin 45° = 0.709$,

$$t = \frac{0.269}{4} \times \frac{1250 \times 0.709 + 260}{1250 \times 0.709} = \frac{0.269}{4} \times 1.29 = 0.08675$$

thus giving $$t = 0.08675 = \frac{1.3108}{m \times 1.466} \text{second}$$

which shows that the wheel action involved occupies a little more than one-tenth of a second with front wheel resistance explicitly considered. The value for m is of course

$$m = \frac{1.3108}{0.08675 \times 1.466} = 10.28 \text{ m.p.h.}$$

The corrected figures thus allow running the vehicle at a speed of 10.28 m.p.h., when first starting, against a traction resistance of 20 per cent figured from the entire vehicle weight. The front wheel resistance is figured as for a wheel of normal type of diameter equal to that of Y, because the resistance at the rim is independent of the type and no appreciable difference arises unless irregular traction resistance occurs.

These figures seem to leave a large margin for gradual application of the power and for use on hills and under other conditions when the traction resistance will be greater than that assumed in the example and the fall of L therefore slower. On the other hand, the figures obtained do not represent maximum vehicle speed, as they are derived from a consideration of a single fall of L through the distance l and the velocity of this fall is greater at the end of it than at the beginning. In the next cycle of the action—meaning the next stretch of road of the length of the arc AC—the vehicle therefore starts with increased speed, and, so long as the traction resistance remains constant, the continuous fall of L increases in velocity until the maximum vehicle speed is reached. While it seems evident that acceleration never can be as rapid with this type of wheel as with normal wheels actuated with an abundance of power, less power seems, on the other hand, to be required for the emergencies for the sake of which great power is usually installed. At all events it is necessary to investigate the question of acceleration and maximum speeds with the composite type of wheel, as shall be done after first applying the test formula to two other examples, notably with β increased and f reduced.

(To be Continued.)

Clover-Leaf Runabout Designs

Suggested Three and Four-Passenger Constructions Outlined

By George J. Mercer

THE advent of the clover-leaf brings into being for the first time a body having a fixed seating capacity for more than two passengers and all the seats equally comfortable, the extra seat always visible and a fixed part of the body design.

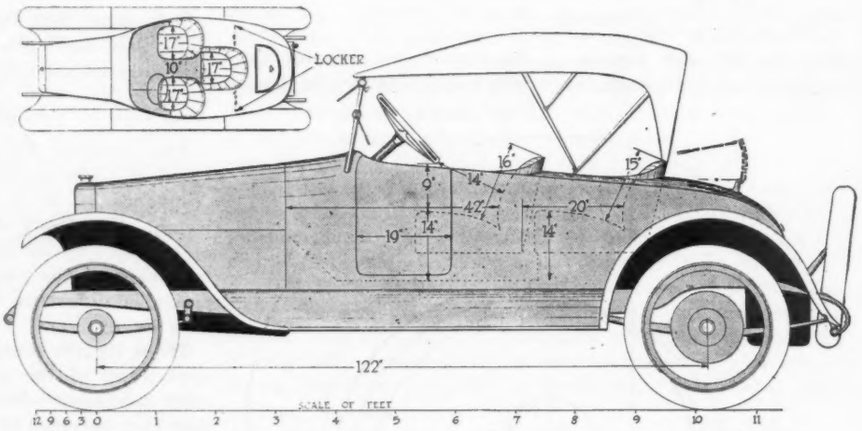
Fig. 1 illustrates a three-passenger body with sloping side line clearly defined from the cowl to stern. The deck of the body is oval and meets the side panel at an angle, the corner being almost sharp. This graduated line from cowl downward toward the rear is the most modern in design and is in conformity with the stream lines. The seat backs project above deck boat-fashion and their relative position is shown in the miniature plan view. In this latter view will be noted the two spaces marked locker. This space from the seat over to the body side is ordinarily accessible by a lid at the top, but with this design, partly because a lid would be inaccessible when the storm curtains were up, and to make the locker proof against leakage from rain as well as to not mar the deck panel unnecessarily, the trimming on each side forms a door covering the opening to the locker. This locker space is deep, generally running down to the floor of the car.

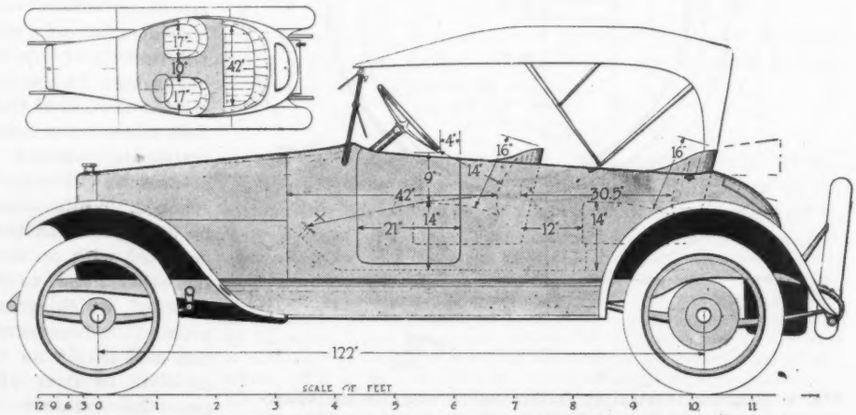
Primarily the clover-leaf permits of a three or four-passeinger body on a very short wheelbase chassis. The entrance through the front seat aisle eliminates any consideration of doors other than those at the front, but the advantage of the close coupled seats, allowing all passengers to converse easily, has made it as popular, with the larger cars as with the smaller ones. The stern end containing the hamper space can always be made of a size to cover the chassis frame, the size of the stern never being taken into consideration in the design. A better proportion to the body is gained, however, when the rear end is large enough to balance to the eye the forward part. The two designs illustrated have been mounted on a 122-in. wheelbase chassis of standard make, and the rake of the steering wheel and the tire irons at rear are regular for the touring car body, but the hood line had been raised at the dash and the height of the cowl will enable the regular instrument board to be installed.

Fig. 2 is a four-passenger body similar in design to Fig. 1, the rear seat being wider. This eliminates the locker space and also is further back, to provide knee room behind the driving seat. On Fig. 1 the aisle is used for this purpose, and the carrying space at the rear is proportionally shortened. The stern end of this body is also different. Looking at the side view, the sloping effect from cowl to stern is maintained, but is not accentuated as in Fig. 1; the body side top line ends with the sweep around the rear seat and the deck of the stern is a rounded surface with the side panel. The two are slightly different in construction, without being markedly different in general appearance. The seats are boat type as in Fig. 1.

The windshield is two-piece, set at 9 deg. from the perpendicular and the position of the sections are shown extended. The top is a one-hand type, and in Fig. 1 the longer stern is used to support a metal block on the cover, on which the top rests when down, a flat plate is fastened to the back bow for a bearing and the leather strap from the rest block passes through a loop on the front of the forward bow and the top is securely held in position. On Fig. 2 the regulation side bow rests are used. The body is sheet metal and the seat backs are bent wood ¾-in. thick, fastened with screws and reinforced. Ordinarily the becks are painted to bring out the grain of the wood, and of a decided contrast to the color of the body. Of late there is a tendency to cover them with the same leather as used for the seats.

The comfort of the driving seat is contingent on the proper room under the wheel to cushion, from wheel to seat back and from seat back to pedal, generally this distance is given from seat back to dash, as indicated, but the more correct dimen-





Above—Fig. 1—A three-passenger clover-leaf with sloping side line.
Below—Fig. 2—A four-passenger type designed along similar lines with less slope

sion is indicated by the line X, this is given as 38 in., which will accommodate the average person, the distance of 4 in. from back of the wheel to the back line of the door will allow a 10½-in. opening between wheel and body, but as the majority of people enter from the curb side, this is not so vital on a left-drive car, and on Fig. 1 this distance is less, the door being 19 in. in width.

Trimming Should Be Leather

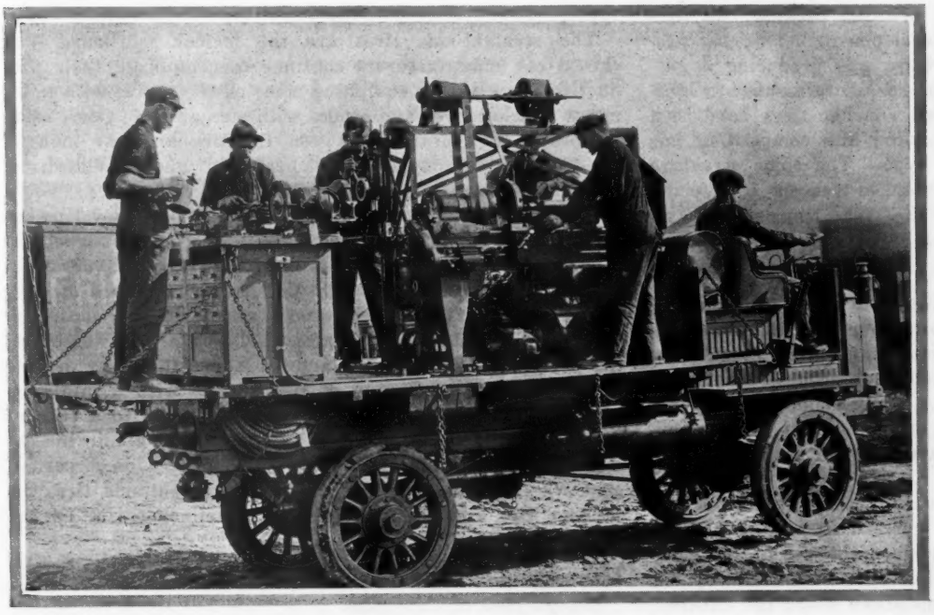
These bodies are trimmed in leather, the seats and backs being of generous thickness and very comfortable. No trimming appears above the body or seat line, the doors have the customary flap pockets and the floor is linoleum covered. Locker space is provided under the seats if possible and the rear compartment has a cover on the top as shown.

The present tendency in color design is about equally divided between the somber shades and gay color. Of the first blue predominates and of the light colors, yellow or yellow and black, white and black, various shades of gray from light to dark and a few reds. If wire wheels are used, they are frequently made to show the contrast in color, black wheels being used with all shades of light colored bodies and the wheels are the only contrast, the guards being of the body color.

The great popularity of the clover leaf style of body, predicted in the summer of 1915 and emphasized by the shows of the early 1916 season, is certainly being upheld, at least in the large cities. The clover leaf is essentially the body for a man who likes a smart appearing car and its chief attraction is that it can have the lines of a racy roadster and yet have a greater capacity. If the rear compartment is not used for passenger accommodation it is often extremely useful for baggage and for carrying golf clubs or other sportsmen's impedimenta. The long aisle provided by the passage between the two front seats is more convenient than even the whole tonneau of a five-passenger car of conventional design.

Type Likely to Persist

Thus there is good reason to expect that the clover leaf or something very much like it should be regarded as a permanent addition to automobile body styles. If its appearance should go out of fashion, if its lines should cease to seem to be as smart as they now appear, still the convenience of the seating plan should hold that part of the design unchanged. Almost any kind of an outer shell can be arranged around a pair of seats of the clover leaf type, in fact the body lends itself to more variation, almost, than any other. That this is true is shown by a study of the very large number of quite different styles produced within the past twelve months.



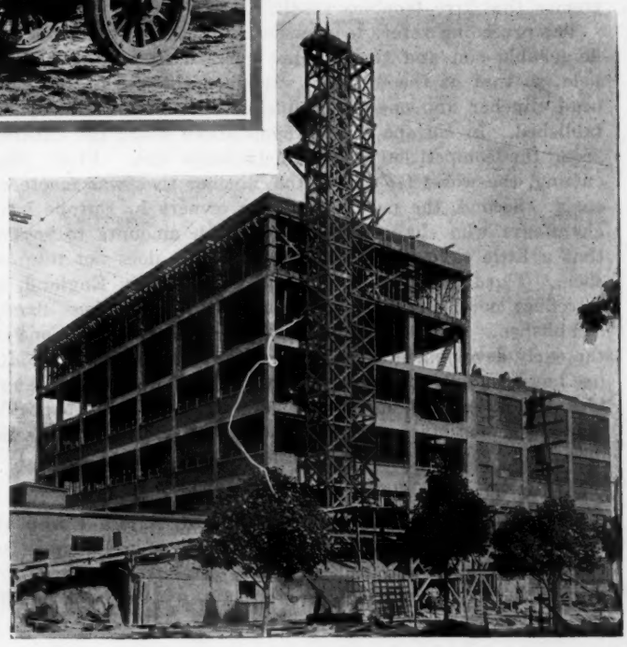
F. W. D. Repair Truck for U. S. Army

ABOVE is illustrated one of the repair trucks built by the Four Wheel Drive Auto Co., Clintonville, Wis., for use by the United States Army. These trucks are fitted for repair work on the road and are expected to prove extremely valuable in keeping the trains of supply trucks in good mechanical condition. Each truck is equipped with a 13-in. lathe with a 5-ft. bed; a drill press; grinder; portable drill; cabinet bench; three vises; a forge; three anvils; oxygen-acetylene welding outfit; a complete set of blacksmith's tools and also complete sets of machine bench tools and carpenter's tools.

A 9-hp. four-cylinder gasoline engine drives the dynamo which furnishes power to the motors which operate the various machines and also supplies the current for the electric light. Oxygen and acetylene tanks are carried under the frame of the truck where they are accessible but do not take up valuable space.

Champion Adds Again

THE Champion Spark Plug Co., Toledo, Ohio, has again been obliged to expand its factory facilities by the addition of the six story building illustrated in course of construction below. In this new structure the company can turn out from 75,000 to 100,000 spark plugs a day and from 1400 to 1500 employees will be engaged in their manufacture, from this time onward.



Pneumatic Tire and Rim Situation

Early Development of the Various Types of Demountable and Detachable Rims—Comparing the Three Types of Tires—Cost of Operation, Reliability—Future Possibilities

By J. E. Hale
Experimental Engineer, Goodyear Tire & Rubber Co.

BY 1907 the detachable rim with a straight-side tire had become so much appreciated by the public that the clincher-tire manufacturers were obliged to furnish some sort of a detachable tire. The result was the quick-detachable clincher tire called the Q. D. clincher. The introduction of this tire was facilitated by the simultaneous introduction of the universal rim, which would take either a straight-side or a clincher tire by simply reversing the side rings.

While the quick-detachable clincher was a half-way compromise between the clincher and straight-side types, its introduction at that time was justified because the tire-building art was in a stage of development, not having progressed to a point where everybody was producing a successful straight-side tire. Up to the present time the straight-side, clincher and quick-detachable clincher tires have been exploited by their respective backers, and competition has stimulated development of each type. The basic structure of the pneumatic tire has not changed (except by the developments in cord tires) since 1907. The rim details have, however, been undergoing constant progressive development.

Rim Development

In 1911 the demountable rim began to receive commercial attention. In 1912 several manufacturers put them on cars as original equipment. The demountable rims were soon widely demanded by the public, which of course stimulated their further development. The early demountable rims were heavy. Competition has brought many new light-weight designs, some of which have been carried to such extremes that tire troubles result.

The preceding refers to American practice. In Europe the detachable rim and tire did not succeed in getting a foothold, so that as the industry expanded the use of the soft-bead clincher and one-piece clincher rims became firmly established. In Europe four circumstances saved the clincher from the competition of the detachable tire. First, rim-cutting, the worst trouble of the clincher tire, was mastered early. Second, the majority of car owners in Europe have chauffeurs who change the tires, which amounts to saying that a little saving in tire-applying effort does not interest them. Third, it is rather difficult, especially in England, to introduce new contrivances in competition with those firmly established. Fourth, the demountable wire wheel was one of the early developments in European automobile practice. Its use has been extended widely, so that if the quick tire-change idea had to be met, it was considered that the demountable wheel was satisfactory. There were no champions of the detachable type in Europe similar to those in America.

Need for European Sizes

In South America, Australia and South Africa European cars have predominated; naturally the use of millimeter-size (European) tires and rims is firmly established. However, during the recent period of trade activity by American manufacturers many inch-size clincher tires and rims have been introduced in these fields. This is most unfortunate because inch-size tires will be used on millimeter rims if the proper millimeter-size tires are not in stock, with certainty of rim trouble. The same thing is true of the application of inch-size tires on millimeter rims. This foreign business is expanding to such volume that the dimensional clincher-tire complication will, unless checked, ultimately react severely against American prospects. American car makers must discontinue the use of inch-clincher (except Ford sizes) and adopt either the millimeter clincher or inch-size straight-side types.

The straight-side tires are the logical solution. Why should car manufacturers continue to complicate their production processes by equipping some of their cars with millimeter clincher tires and others with straight-side tires, when by proper co-operation between the tire and car makers, the straight-side type, fully perfected and standardized, can be introduced quietly into these markets?

The refinements accompanying the intensive development of the motor car have reached a point where even the weight of the light demountable rim is regarded with disfavor. A return to the simple light-weight detachable rim fitted directly to the felloe of the wheel seems likely. The car designers want to eliminate weight, particularly unsprung weight, at the periphery of the wheel, and to reduce the cost; the car owner desires a maximum of tire service with a minimum of tire trouble. Thus the situation boils down to a case of the survival of the fittest with the demountable rim, the demountable wheel and the simple rim mounted on a permanent wheel on the one side; and the straight-side tire, the clincher tire and the quick-detachable clincher tire on the other.

Three Types of Tires Compared

The purpose of this paper is to point out the trend of the time in the tire world, and to venture a prediction concerning the future. In order to lay proper stress on the points to be brought out, it seems wise to discuss the merits of the three types of tires under the following headings: Energy consumption; traction; total mileage; cost per tire-mile; cushioning effect; reliability; ease of applying; and service.

Figs. 2, 4 and 8 show the straight-side, quick-detachable clincher and soft-bead clincher tires that will be compared. These are drawn to scale. The straight-side tire is shown on the wide standard rim. All three tires will be identical in every particular above the line *H-K;* consequently the energy consumption and traction would be the same for each type.

Factors Affecting Total Mileage

The total mileage would be influenced by the structure of the tire below the line *H-K*. While the schemes of attachment to the rims have been largely perfected, the life of the tire is sometimes shortened by a form of trouble com-

monly called rim-cutting. In a well designed and properly built tire the chances of rim-cutting troubles from causes inherent in the tires themselves are remote. Imperfect rims and various forms of abuse are the actual causes. If a tire is punctured and ridden flat, the clincher casings and tubes will soon be ruined beyond repair. The clinch of the rim simply gouges into the carcass of the tire and cuts through the plies. At the same time, the tube gets under the toes of the bead, which mutilates it beyond repair. The structure of the straight-side tire, on the other hand, is such that the carcass is simply crushed against a comparatively wide rounding surface. Of course, the straight-side tire and tubes can easily be ruined by this form of abuse, but the chances are three to one in its favor, compared with the other type. The effect of the quick-detachable clincher is about half way between that on the clincher and straight-side tires. In this case the toes of the bead do not lift to catch the tube, but the clinch of the rim gouges into the fabric of the casing to some extent.

Under-Inflation and Overloading

These are similar in their effects on the structure of the tire, being forms of abuse that aggravate any tendency to rim-cut. The effect is more pronounced on the clincher type than on the straight-side, because the flexing of piles is localized at the edge of the clinch with the former, while with the latter the flexing is distributed with less intensity over the gradual curvature of the rim.

Tire-Mile Cost of Operation

The cost per tire mile is of course a function of the mileage and of the original cost of the tire. Inasmuch as the three types cost the same, the tire-mile cost is directly proportional to the mileage. Since the tires of the different types are alike above the line *H-K*, the service will average the same for all so far as the upper part of the tires is concerned. Any variation in the tire-mile cost will be dependent on the complications introduced by tire-base troubles. While no specific cost figures can be presented, there is no doubt that the tire-mile cost of the straight-side tire is the lowest. This is strongly emphasized by the domination of the straight-side over the quick-detachable clincher tires as shown in the percentages given in Table I.

TABLE I—TIRE EQUIPMENT (IN PER CENT) ON CARS PRODUCED 1913-1916

Type of Tire	1913	1914	1915	1916
Straight-Side Equip.	32	72	84	96
Quick-Detachable Clincher Equip.	40	28	16	4
Universal Rim	28	.....	.....	.....
Total	100	100	100	100

Cushioning Effect

For a given tire section the cushioning effect is largely dependent on the relation between the load and inflation pressure. Lowering the inflation pressure gives the greater cushioning effect, but on the other hand fabric troubles are greatly increased by excessive flexing of the carcass. In practice it has been found that the best inflation pressure will permit the tread to be depressed 11 to 12 per cent of the tire section. Since all three types are alike above the line *H-K*, the cushioning qualities are the same if the tires are operated under similar conditions.

Scope of Reliability

The difference in the rim-attachment structure of the two types has an effect on the cushioning properties. A straight-side and a quick-detachable clincher tire of the same size and design to require the same quantity of raw materials, are superimposed in Fig. 1. This shows that the straight-side tire has the advantage due to the beads of the tire being more widely separated, resulting in a slightly larger diameter of tire section.

Reliability covers such features as freedom from instantaneous failures and safety considerations. Punctures, blowouts and fabric breaks occurring in the tread and side-wall portion of the carcass (above the line *H-K*) are on a par in all three types. Fabric failures at the point of contact with the rim are apt to be more in the nature of a concealed distress followed by sudden failure (blowout in effect) in the clincher and quick-detachable, while the corresponding troubles with the straight-side tires are easier to detect and provide against.

Blowing Off the Rim

Blowing off the rim is one of the troubles of bygone days. The early straight-side tires had a good many black marks against them on this account and clincher tires are still occasionally subject to this annoyance. This condition was one of the prime excuses for the introduction of the quick-detachable clincher tire. Because some of the early straight-side tires blew off the rim, certain car makers concluded that this type was not safe. It was not appreciated universally that the straight-side construction is a purely mechanical method of attachment and independent of inflation pressure. At the same time the detachable idea was so meritorious that all tire manufacturers were compelled to put out some sort of a "detachable" tire. Inasmuch as the soft-bead clincher had represented the best practice in was natural to combine the inextensible bead of the straight-side with the clincher idea in an attempt to provide a detachable tire that would not blow off the rim. In the undeveloped state of the tire-building art it was felt that in order to be perfectly safe a tire must hook under the clinch of a rim. The later development of the straight-side tire has, however, shown conclusively that the problem of safety was simply one of designing the tires to have proper strength at the weak point, so that at present, for every several hundred that fail by rim-cutting and blowouts, only one tire blows off the rim.

TABLE II—TIRE AND RIM EQUIPMENT ON CARS PRODUCED 1913-1916

	1913		1914		*1915		*1916	
Type	No. Cars	Per Cent	No. Cars	Per Cent	No. Cars	Per Cent	No. Cars	Per Cent
Q. D. Clin.	98,000	24	66,500	19	50,000	8	22,000	2
Str. Side.	79,500	19	172,000	35	266,000	40	529,000	46
Reg. Clin.	175,000	41	281,000	46	348,000	52	601,000	52
Univ. Rim.	67,000	16	None used	....	None used	....	None used	....
Totals	419,500	100	519,500	100	664,000	100	1,152,000	100

*Figures are for manufacturers' season—July to July.

TABLE III—SOFT-BEAD CLINCHER TIRES AND ONE-PIECE CLINCHER RIMS ON 1916 CARS

Name	Tire Sizes		Name	Tire Sizes	
Bell		3½	Monroe	3	3
Briscoe		3½	Metz		3½
Chevrolet	3	3½	Regal		3½
Dort		3½	Overland		4
Elco		3½	Pullman		4
Ford	3	3½	Scripps-Booth		3½
Maxwell		3½	Sphinx		3½

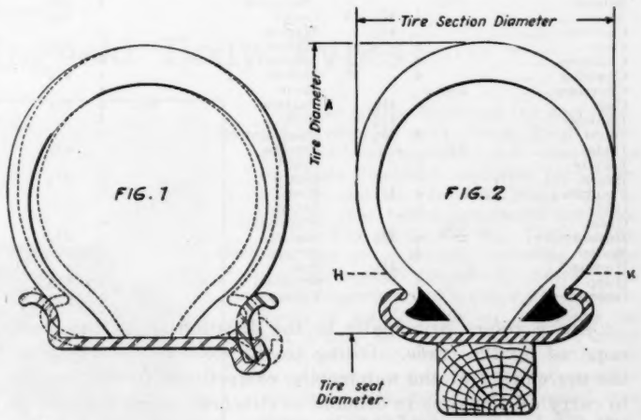


Fig. 1—Straight-side tire (full lines) superimposed on quick-detachable clincher tire (dotted lines). Fig. 2—Soft-bead clincher tire mounted on one-piece rim

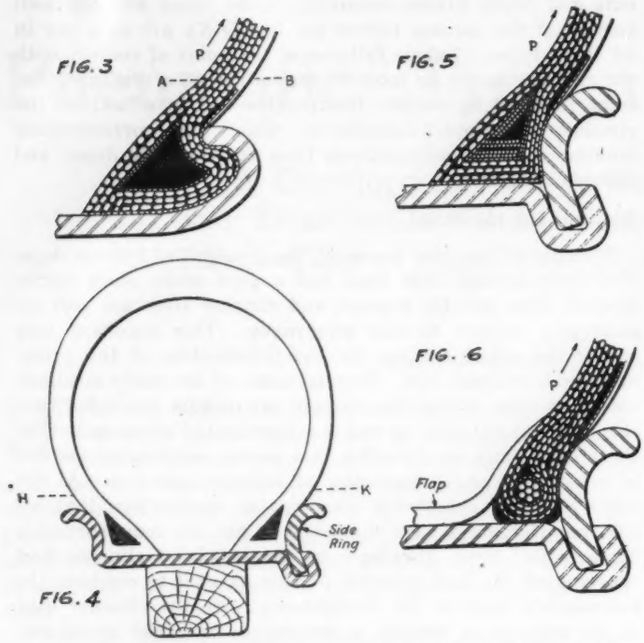


Fig. 3—Details of clincher rim and bead. Fig. 4—Straight-side tire mounted on two-piece detachable rim. Fig. 5—Inextensible braided-wire bead. Fig. 6—Inextensible twisted-wire bead

How completely the straight-side tire has lived down original prejudices is evidenced by the fact that 529,000 new cars will be delivered on straight-side tires during the 1916 season.

Ease of Applying

The 3-in. clincher tires are no more difficult to remove and apply than the other types, but beginning with the 3½-in., each larger size is correspondingly more difficult to handle. In applying the quick-detachable clincher tires the bead needs considerable coaxing to get it properly seated under the rim clinch; and the carcass of the tire is often so stiff as to make it difficult to slip the locking ring into place. This is especially true with the oversize tires. The quick-detachable tire is frequently found to be frozen to the rim by rust, thus requiring much effort in removing it. This tire on a split rim is really a formidable proposition; application is difficult and removal almost impossible.

Table IV—Straight-Side Tires on 1916 Cars

Name	Tire Sizes			Name	Tire Sizes		
Abbott		4	4½	Jackson		4	4½
Allen	3½			Jeffery		4	4½
Alter	3½			Jones		4	
Apperson		4	4½	King		4	
Auburn		4		Kissel		4	4½
Briscoe	3½			Lexington		4	4½
Buick		4	4½ 5	Lozier			4½
Cadillac			4½	Marion		4	
Case		4		Meteor			4½
Chalmers		4		Mitchell		4	
Chandler		4		Moline		4	4½
Chevrolet	3½			Moon		4	
Cole			4½	Oakland	3½	4	4½
Daniels			4½	Olds		4	
Davis		4	4½	Paige-Detroit		4	
Dodge	3½			Peerless			4½
Empire		4		Regal		4	
Enger		4		Reo		4	4½
Franklin		4	4½	Ross		4	
Glide		4		Saxon	3½		
Grant	3½			Studebaker		4	
Haynes		4	4½	Stutz			4½
Hollier		4		Scripps-Booth		4	
Hudson			4½	Sun		4	
Hupp		4		Overland		4	4½
Interstate		4		Velie		4	

Service refers principally to the distribution of the sizes required by the trade. Owing to the extreme flexibility of the movements of the automobile, competition forces dealers to carry all the sizes in demand in clinchers, quick-detachable clinchers, and straight-side types.

Early in this paper it was stated that the tire and rim questions boil down to a question of the survival of the fittest. The statistics in Table II show very decidedly the trend.

It is just a question of time until the quick-detachable clincher will become eliminated. This tire had a legitimate place during the period of development, but with the straight-side tires giving entire satisfaction, there is no excuse for continuing the former type. Dealers have to carry the three kinds of tire with many sizes common to each type. With the quick-detachable clincher eliminated, nearly one-third the stocks could be discontinued, which would mean correspondingly better service on the other two types, less capital tied up in stocks, greater incentive to carry all sizes, and ultimately less expense to the whole industry, and more simplified production.

Tire Equipment of Various Makers

To further explain the situation, I have prepared the Tables III, IV and V (from published information), showing by size and type the tire equipment used on the principal cars. Pneumatic-tired trucks are not included.

The total estimated production in 1916 is 601,000 cars using clincher tires and one-piece clincher rims. This estimate applies to the fourteen makers listed in Table III.

Table V—Quick-Detachable Clincher Tires on 1916 Cars

Car	Tire Sizes		Car	Tire Sizes		
Cunningham	4½	5	Pathfinder		4½	
Fiat	4½	5	Pierce		4½	5
Locomobile	4½	5	Premier		4½	
Marmon	4½		Stanley		4½	
McFarlan	4½		Stearns	4	4½	
Mercer	4½		Stutz			5
National	4½		White	4	4½	5
Packard	4½	5	Winton		4½	
			Westcott	4	4½	

The total estimated production in 1916 is 529,000 cars using straight-side tires. This estimate applies to the fifty-two makers listed in Table IV.

The total estimated production in 1916 is 22,000 cars using quick-detachable clincher tires. This estimate applies to the seventeen makers listed in Table V.

From the three groups tabulated we observe (1) Clincher tires are confined to 3 and 3½-in. sizes. (2) Straight-side tires are used in 3½, 4 and 4½-in. sizes. (3) The quick-detachable clinchers are confined to the 4, 4½ and 5-in. sizes.

Concluding Comments and Predictions

The pneumatic tire has passed through its evolutionary stages. Future developments will be confined to refinements intended to eliminate the common tire troubles, and to increase the tire mileage.

The American standard inch clincher-rim contours, the British standard millimeter clincher-rim contours, and the American wide standard inch straight-side rim contours will undoubtedly survive all others.

Outside of the contours, however, rims are still in process of evolution. In the struggle to minimize weight, expense and tire troubles the existing demountable types may lose ground, particularly as the light-weight one-piece clincher and the two-piece straight-side rims, either on permanent or detachable wheels, apparently offer the next step forward.

Extra Types Will Be Eliminated

We now have uneconomical duplication in sizes in three types of tires performing similar service, but the law of natural selection will effect the elimination of the unnecessary types. Probably clincher tires (in America) will be confined eventually to motorcycle and 3 and 3½-in. automobile tires. Straight-side tires will be used in some 3½-in. and in all larger sizes. The quick-detachable clincher will shortly disappear from use.

The export markets in absorbing American cars will assimilate American constructions more and more readily. Straight-side tires will be introduced into these markets dur-

ing the coming season as original equipment on some American cars. This type will presently be appreciated as much abroad as it is in America. Thus we are to initiate a step that will result ultimately in a single world-wide standard for pneumatic tires and rims.

Figs. 2 to 11 are inserted for the benefit of persons desiring more detailed information on tires and rims.

The base portions of the tire in Fig. 2 have sufficient elasticity to permit their being stretched and pried over the the edges of the rim when applying and removing it. The extensible bead core is made of semi-hard rubber.

The bead in Fig. 3 is understood to be the entire portion of the tire below the line *A-B*. The bead core is made of semi-hard rubber, which has just enough stretch to allow it to be pried over the rim. The tires are made about ½ in. smaller than the tire-seat diameter of the rim. This insures a snug fit against the rim and prevents the tube from pinching.

The internal bursting pressure of the air sets up stresses in the direction indicated by arrow *P*. These stresses are resisted at the hook of the clinch. In other words, a soft-bead clincher tire in its functioning is positively dependent on the air pressure to maintain its shape and position.

In Fig. 4 the side ring is cut in one place and can be removed by prying out with a screw driver. Figs. 5, 6 and 7 show enlarged details of three prominent types of straight-side beads. Each bead is made inextensible by an endless reinforcement of braided wire (Fig. 5), twisted wire (Fig. 6), and wire cables (Fig. 7).

In the type shown in Fig. 7 the fabric plies are tied under the inextensible reinforcing wires; thus the side wall stresses (*P*) are transmitted from the carcass fabric to these circumferential wires. It will be seen that a strictly mechanical method is used to fasten the tire to the wheel in contrast to the soft-bead clincher method, which is analgous to the action of an elastic band. The inside diameter of the tire is slightly greater than the corresponding rim diameter (1/32 to 3/64 in.), which permits the tire to be applied and removed easily.

While the chance of pinching tubes under the beads of straight-side tires is remote flaps are used in the larger sizes, as a precaution.

In the quick-detachable clincher rim, Fig. 8, the side ring is endless while the locking ring is cut in one place. In removing the base of the tire and the side ring embracing it must be crowded bodily toward the center of the rim far enough to clear the inner edge of the locking ring. The locking ring can then be removed by prying out with a screwdriver, after which the tire and the side ring can be removed.

Figs. 9, 10 and 11 show enlarged details of the bead structure of the quick-detachable clincher tire. By comparing Figs. 5 and 9 it will be appreciated readily that Fig. 9 simply shows a straight-side tire with the addition of a clinch filler. This clinch filler is not tied into the body of the bead (by gripping with pliers the whole filler can easily be torn off the tire); consequently it is of absolutely no value in helping to hold the tire in the rim. Its real function is to fill the void that would otherwise exist.

Fig. 11 compared with Fig. 6 shows a similar situation, except that the outside ply of the carcass is laid so as to include the clinch filler. In Fig. 10 the quick-detachable construction closely resembles the regular soft-bead clincher construction. In this case, however, the bead core is made of a mass of cords impregnated with hard rubber extending circumferentially around the tire. The bead of this tire is really semi-extensible.

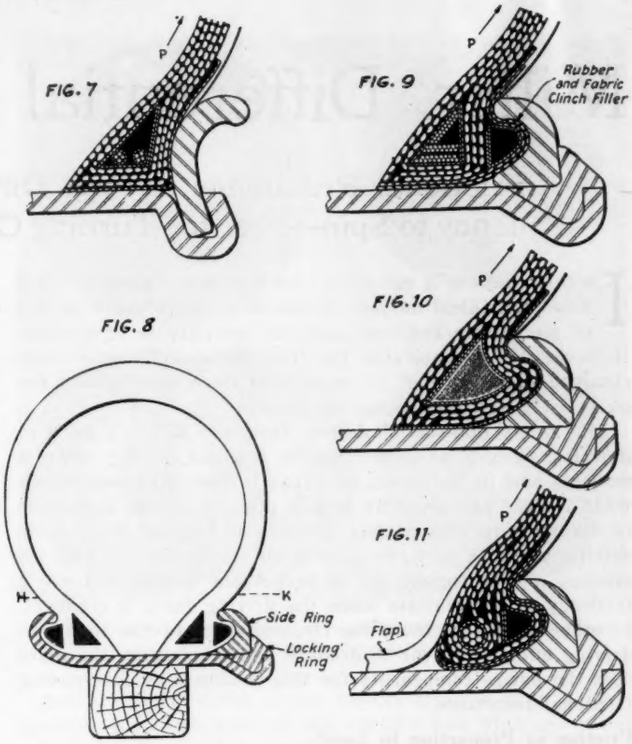
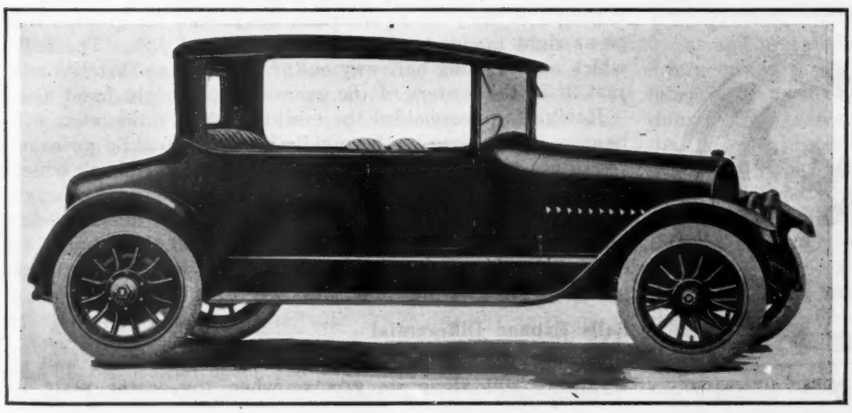


Fig. 7—Inextensible wire-cable bead. Fig. 8—Quick-detachable clincher tire and rim. Fig. 9—Inextensible braided-wire bead on quick-detachable clincher tire. Fig. 10—Bead of parallel cords on quick-detachable clincher tire. Fig. 11—Heavy wire bead on quick-detachable clincher tire

The New Cole-Springfield Body Types



AT the left is illustrated the new Cole-Springfield body, which, fitted to the standard eight-cylinder Cole chassis, is styled the Tourcoupé and sells for $2,195. *This is one of the new group of all-weather type bodies announced last week by the Cole Motor Car Co., Indianapolis, Ind., the other models consisting of the Cole-Springfield Toursedan, which is a seven-passenger car meeting the requirements of both touring car and limousine and selling at* $2,195, *and the Towncar listed at* $2,492. *These bodies are luxuriously fitted out, being finished in American flag blue with dull black trimming and mouse gray upholstery. There are automatic electric door lights and light switches are located both at the driver's seat and in the tonneau.*

Miller Differential Has New Motion

Frictional Resistance to Free Differentiation in Proportion to Tendency to Spin—Free for Turning Corners Yet Stiff Against Spinning

IN these days it is not often that a patent is granted for a new mechanical motion, as almost every conceivable sort of mechanism has been used for one purpose or another. However, the inventors of the Dorr-Miller differential have obtained such a patent in addition to their main patent for an entirely new differential mechanism.

Like many differential devices the Dorr-Miller is hard to describe, though its action can be grasped quickly when a model is held in the hands, so it may be best to explain firstly what it does and secondly how it does it. What it does is to differentiate with perfect freedom as long as there is no driving pressure on it, to tighten up as the driving load increases, and to tighten up in proportion to any and every tendency to differentiate when the driving force is constant. In other words the more the circumstances of the road and driving effort endeavor to produce wheel spinning, the more does the device compensate for this tendency by interposing frictional resistance.

Friction in Proportion to Load

The reason for this action can be expressed loosely as follows: There are two disks forming the two halves of the differential with the special mechanism between them. These disks and the mechanism are contained within a differential case of the usual sort made of steel. The action of the driving force of the engine tends to spread the disks apart, so causing them to press upon the inner walls of the case. When running straight ahead case and disks revolve solid, just like any other differential, but when one wheel tries to turn faster than the other its tendency is resisted by the friction of the disks pressing on the inside of the case. This means that, when outside circumstances accelerate one wheel the internal friction tends to slow that wheel down or to accelerate the other wheel, which is equivalent to saying that the friction causes both road wheels always to try to turn at the same speed. If one wheel is jacked off the ground and the engine started in gear, the raised wheel will revolve freely just as with the conventional type, but the slightest resistance offered to the free wheel, the least touch of the brake for example, immediately transfers torque to the wheel resting on the ground and the car rolls off the jack. This is because the resistance causes the two disks to spread apart, whereupon they rub against the inside of the differential case and the frictional drag caused by a light resistance applied to the free wheel is enough to cause the locked wheel to move the car. With the clutch out the differential is just as free and differentiates just as perfectly as any other type.

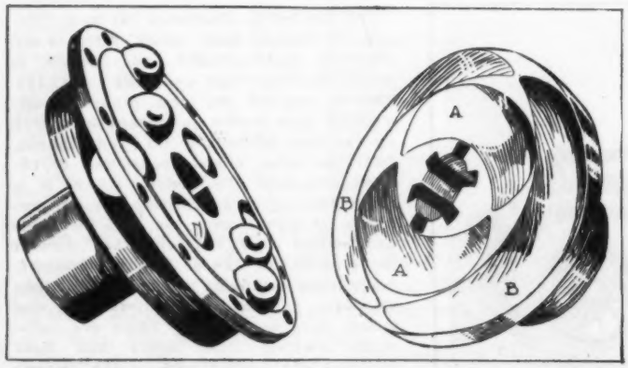


Fig. 1—Sketch to explain action of Dorr-Miller differential

Ball Forms Grooves

Now to describe the mechanism by which these results are obtained. Referring to the sketch Fig. 1 the two disks are seen on right and left. Each disk has grooves cut in the face, *A* and *B*, and these grooves are deep and wide at the middle of their length, tapering off at each end. The form of these grooves may be pictured by taking a ball and rolling it along some plastic material like putty. Rolled gently it will make no mark but if pressure is applied it will sink in, going deeper and deeper as the pressure is increased. Imagine the pressure increased regularly until the ball was buried for a depth of half its diameter and then released again till the ball once more rolled up on the flat surface of the putty, and you would have a straight groove exactly like the curved grooves cut in the Miller differential disks.

Having got the disk, imagine a plate with four holes in it, each just large enough to hold a ball of the same size as the ball with which the grooves were generated. Stand the plate on the disk with a hole opposite the center or deepest part of each groove and drop in four balls. Then, if the groove is half the ball diameter deep and the plate is as thick as the groove is deep, the four balls will lie in the holes and will just come flush with the face of the plate.

Effect of Turning Plate

Now turn the plate around upon the disk and each ball will roll along its groove till it reaches the end and, as it rolls along, it will rise through the hole in the plate till it no longer engages the groove (having come to the end) but stands half projecting from the hole. In the sketch the plate is shown with eight balls, four being at the centers of the grooves and four at the ends.

Next, continue the turning of the plate and the four balls which were standing out will begin to sink down again into the next groove. In other words the outer grooves *B* and the inner grooves *A* guide the balls just as though they were running in a ball thrust bearing, with the difference that the balls reciprocate to and fro through the holes in the retaining plate.

But so far we have considered only one disk and the plate. The other disk has corresponding grooves and, if we imagine it placed on the plate as shown in the sketch, the grooves will be at right angles to those in the left hand disk. The balls which are standing half way out of the plate as sketched will just fit in the centers of the grooves in the right hand disk.

Having thus assembled the essential parts think what will happen if the plate in the middle is revolved while an equal resistance is applied to each of the two disks. The ball which is at the bottom of the groove in one disk cannot rise through the hole in the plate because it is opposite the neutral point between the grooves in the other plate, and this applies to each of the eight balls. Thus the two disks will turn with the plate, all three at the same speed.

Balls Expand Differential

Now, another thing that is obvious occurs. Each ball is trying to roll along its groove, when the center plate is

turned, and it is prevented from doing so by the opposite disk which prevents it from rising through the hole. This causes a thrust or spreading action tending to force the disks apart. But there is a case around both disks to which the bevel drive gear is bolted, precisely as with the conventional differential, so the back of each disk is pressed against the interior of the case behind it and the harder the driving pressure on the plate the harder will the disks try to separate and the harder will they press on the walls of the case. Which explains how the frictional resistance to differentiation increases as the driving effort increases.

How It Differentiates

So far so good, but perhaps it is still not clear how the device can differentiate at all. To follow this action suppose that we stand one disk on the table, put the plate and the balls in position just as in the sketch and then place the other disk on top. Now, leaving the center plate free, turn the upper disk. This causes the upstanding balls to act like dowel pins in the plate and so makes the plate move forward in the same direction as we are turning the upper disk. As soon as the plate has moved, the upper balls will begin to run down into the grooves in the lower disk and the lower balls to rise up into the grooves of the upper plate. The balls act exactly like the planet wheels in a bevel differential and the center plate will revolve at *half* the speed of the disk we are turning. Of course this action can be reversed, that is if we turn the center plate the free, upper disk will revolve at *twice* the speed of the plate.

If this experiment is tried with the parts as shown and with no case to hold them together, a slight touch on the disk when turning the plate will at once cause the disk to jump; showing that small resistance creates a strong tendency for the two disks to separate. Since the device will operate as a perfect differential with one side stationary and the other free, it is obvious that it will still operate if we allow the under disk to turn too. Instead of standing the lower disk on a table, rest it on a greasy slab of glass. Then a sharp twist given to the center plate will cause the upper disk to move fast and will also cause the lower one to move slowly.

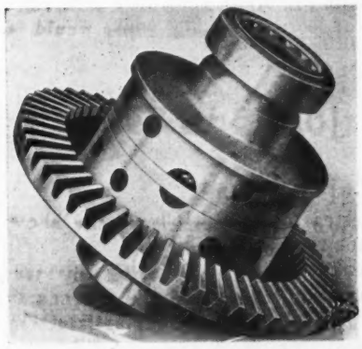


Fig. 3—The complete differential ready for assembly in the rear axle

Another Explanation

There is another way of explaining the action of differentiation. It is sometimes not clear, even with the differential in the hands, why it is that the two disks cannot revolve at the same speed without moving the plate. To explain this imagine a ball at the bottom of the lower groove *A* in the sketch. For this ball to get to the upper groove it has to run up to the end of lower *A* over the dividing piece and then down into upper *A*. Now it cannot do this unless two things happen together, one being that the other disk moves round so as to bring the deepest part of its groove over the dividing line at the time the ball crosses, and the other that the center plate also moves to allow the hole in which the ball lies to come round from the starting position to the finishing position of the travel of the ball.

The device is not only hard to describe in words and sketches, it is even hard to follow when handling the actual model, but it becomes clear after a little concentrated thought.

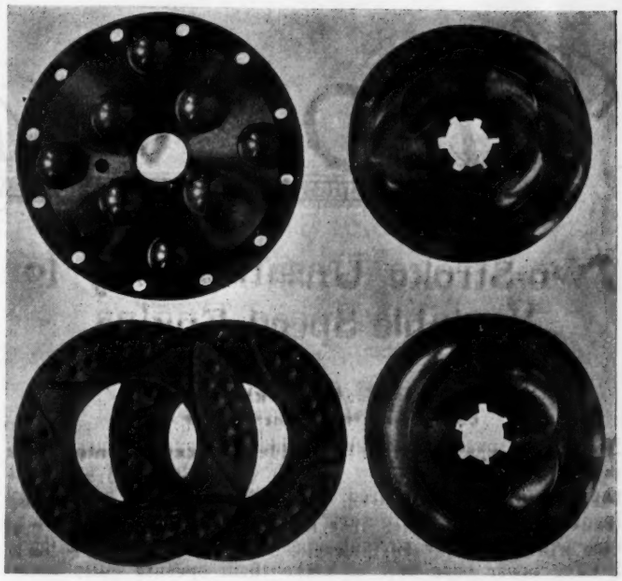


Fig. 2—All the internal parts of the differential as they appeared after the Purdue University test

Another thing which is not readily clear is why the differential will allow a car to pull out of a hole when one wheel only has a grip of the ground. To grasp this action suppose the wheel in the hole is spinning. Then all the power of the engine is going to this wheel. Since the expanding action of the differential causes internal friction the power is really divided between that absorbed by the spinning wheel and that used up in friction. But as soon as the other wheel moves the friction is relieved; therefore the friction exerts a torque upon the wheel having a grip on the ground and as the friction is large the torque is also considerable.

Self-Locking Action

This self-locking action by which the friction induced by the spreading of the disks arrests the spinning of the wheel without traction and converts its motion to torque on the stationary one may be explained in another way. Imagine each wheel with an independent brake. Obviously if a brake is applied to the spinning wheel it will be slowed down and the torque will be transmitted through the differential to the other wheel.

Of course there is no such brake in the differential under discussion, but the spreading of the disks into contact with the differential casing acts in the same way. Both disks are separated with equal force, but only that on the side of the spinning wheel has a braking effect because only on that side is there motion taking place between the disk and the casing relatively.

In practice the spreading action produces considerable forces and presses the disks against the containing case with heavy pressure. Their surface is large and provided with lubricating grooves as shown in the photographic illustration, and extensive tests made at Purdue University show that there is practically no measurable wear within a reasonable time. There is no backlash whatever when the gear is new, and none after a considerable period of use. Incidentally, the Purdue tests were made in a stout rear axle taken from a well known car and the forces applied were so great that the axle drive shafts were twisted till one of them broke off; which means the loads were greatly in excess of anything that could occur in practice.

At present the differentials are being manufactured on a small scale by the Miller Transmission Co., Karpen Building, Chicago. Arrangements are being made for a very large output in the near future.

The FORUM

DO TWO-CYCLES OPERATE SUCCESSFULLY UNDER ALL LOAD AND SPEED CONDITIONS?—MORE VIEWS ON DIFFERENTIAL PROBLEM—RATTLING FENDERS

Two-Stroke Unsatisfactory for Variable Speed Engine

By C. C. Hinkley
Chief Engineer, Chalmers Motor Co.

I HAVE passed through considerable experimental work on two-stroke engines and in conclusion will say that they left a lot to be desired. For constant speeds and steady loads I believe they are very satisfactory especially for marine work; but, for variable speed engines of varying loads I have never been able to make them operate quite satisfactorily. I have never been able to make them two cycle under all conditions of load and speed. This is the one main drawback in connection with this motor which caused me to shelve the idea some time ago. It may be that my experimental work was not carried as far as it might have been at the time. However, I would very much hesitate to go into it again, knowing the difficulties that are to be encountered.

Resistance Differential Logical Solution

By John Squires
Vice-President and Secretary, Signal Motor Truck Co.

WE agree that it is obvious that from a constructional point of view it is desirable to eliminate the differential.

The writer can recall many situations in his past personal experiences in driving trucks, where the elimination of the differential would have been much of a handicap and consequently we cannot agree at the present moment that, from the operation point of view, this elimination would be desirable.

The resistance differential seems in our mind to be the logical solution of the matter at the present time, and we would prefer to see this more fully developed than that the differential be eliminated altogether.

Should Conduct Differential Experiments

By B. T. Birdsall
President, Kosmath Co., Inc.

IN regard to the elimination of the differential from trucks. This is a subject on which I have not given much thought but has been put forward by one axle maker. It would seem to me, however, that very thorough and exhaustive experiments should be conducted over a considerable period of time and in different localities before it would be safe to adopt so vital a change.

There is no question that if we could eliminate the differential it would be a good thing in many ways, but at the present time I would regard it as more or less of a dangerous proposition.

Fenders Rattle Too Much

By E. T. Crilley

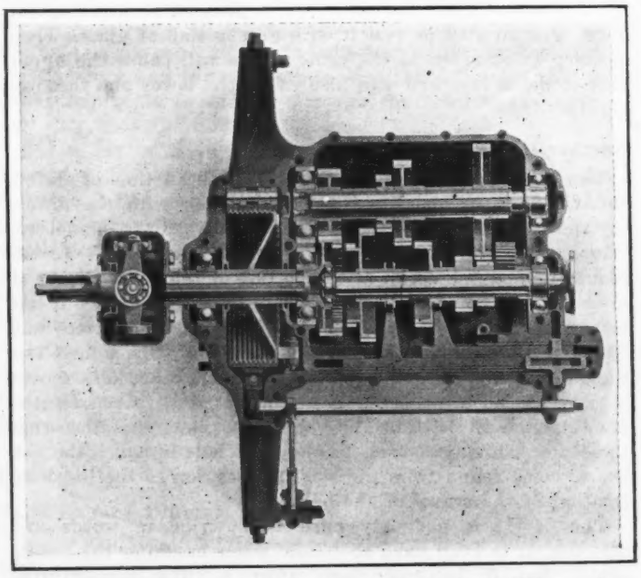
ONE of the most disagreeable things about the modern car, it seems to me, is likewise one of the most unnecessary. I refer to the rattling which frequently emanates from the fenders, especially after the car has been in use for some time. Of course, if the fenders are bent or broken in any way, some noise may be expected, but if our designers and builders would give the matter a little attention, I am sure that rigid mounting and elimination of loose or chafing edges would be avoided.

Universal Joints in 1905

By W. J. P. Moore

I WAS very much interested in your article on the above subject in THE AUTOMOBILE for May 25.

I am sending you an illustration of a ball bearing universal I used on the tail shaft immediately behind the gearbox in a car I built in 1905 and with which I had very satisfactory results; perhaps it will be of interest to you.



Ball bearing universal used on a car built in 1905

The History of the Pneumatic Tire—10

Further Activity in 1892—Michelin Tire Enters the Field—Introduction of Multiple Inner Tubes—Rapid Adoption of Pneumatic Tires for Bicycle Use

The History of the American Automobile Industry—37

By David Beecroft

CONTINUING the story of the tires invented or brought out in the year 1892, as begun in last week's installment of this series, there are a number of constructions which have not been mentioned. Some of these are briefly reviewed this week.

Sercombe-Bolte Construction

The Sercombe-Bolte tire of 1892 used a rim with its edges hooked outward instead of inward, and the tire had a flat metal wire in its edge of a diameter large enough to fit into these hooks. These metal wires were flexible enough to be forced into place, and when in place, prevented the tire edge from being pulled out of the groove, the main part of the strain being taken on that part of the rim which formed the point of the hook. This shape, however, caught dirt badly, was not easy to apply, tended to rim-cut and sometimes pinched the air tube.

The Michelin Tire

The Michelin tire, originated in France, was introduced in 1892 and used a rim flat on top but deeply grooved at its edges much like the rim of the Duryea cushion tire except larger. The tire casing had beads on its outside which were dropped into the bottoms of these grooves and endless rings placed in position over them, so the beads could not be pulled out. This rim, however, being of special shape and particularly objectionable because it filled with sand and mud, did not find favor and was quickly superseded by the Burris-Michelin, which used a casing having wires in its edges like the Dunlop but without the Dunlop rim. The rim used was flat bottomed and the wired edges were larger than the bottom of the rim so that a ring of square rubber or fabric could be placed in the corners of the rim and form a shelf for the edges of the tire casing. When this shelf ring was removed, the tire could be easily lifted over the rim edge and removed. It was one of the many attempts to evade the Dunlop wire-base construction.

Use of Multiple Tubes

In the same year, 1892, was introduced a tire having three air tubes or compartments any one of which could be used if another became punctured. The fault with this construction was that the point which punctured one was likely to puncture the next, unless it was found and removed, and often this required that the casing be examined on its inner surface. The multiple-tube idea has therefore not found favor. The same inventor, Dorr, developed a tire much like the Michelin but using a rim like the Burwell. Metal rings separate from the tire, instead of incorporated in their edges as in the Burwell, were used to hold the beads up into the outwardly turned rim hooks. This tire was found disadvantageous in much the same way as the Burwell and was not produced to any great extent.

The Pneumatic Gains

The indisputable advantage of the pneumatic tire forced the larger bicycle companies to supply it this year, in spite of the good business conservatism which prompted them to continue the all-rubber tires. The Pope Co., Morgan & Wright, and a number of others simply split the base of the hose pipe tire at one or two places and inserted an air tube, having closed ends which were abutted together, after which the openings were laced and the tire put in place. Canvas protectors were provided where the air tubes might be damaged by the lacing or the slits, and in some cases this canvas was extended completely around the air tube as on many modern air tubes. The Victor company, to avoid removing the tire and recementing it whenever it was necessary to remove the air tube, fitted its bicycles with rims having an opening through which the air tube could be reached and inserted or removed.

The Hose Pipe Type

It is well to distinguish the so-called hose pipe single tube tire in which the several layers are composed of ordinary canvas about an inner air tube and the hole vulcanized together, resulting in the identical structure found in a canvas-made hose pipe, whence the name. The only novel feature is the adjoining of the ends to form an angle and the insertion of a valve in the tube for the purpose of inflation.

The Rostrum

Steps in Installing an Air Starter

EDITOR THE AUTOMOBILE:—Please give a full explanation of the principle involved in the construction of an air starter? My four-cylinder engine has 4¼ by 5½ in. bore and stroke. I have a B Prest-O-Lite tank, a high pressure gage and safety valve.

Kindly describe and illustrate the parts necessary in this work.

Pittsburgh, Pa. J. G. H.

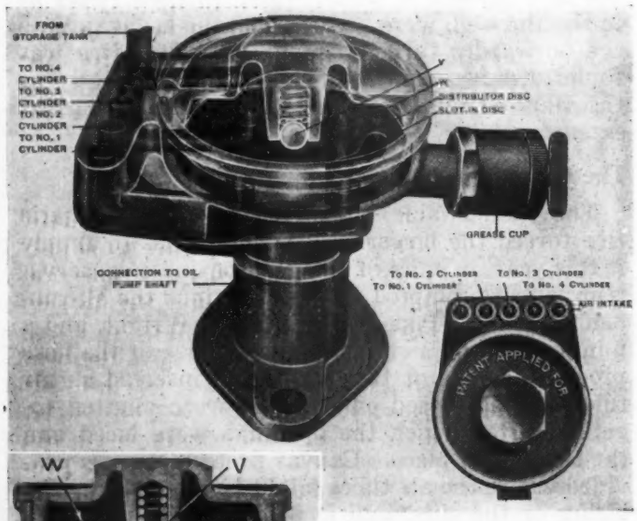
—The principle of the air starter is very simple as it is merely an arrangement for introducing compressed air instead of gas into the cylinder. The compressed air in expanding cranks the motor until it takes up its own cycle. It would not be practicable for you to attempt to make an air starter with the equipment you mention as one of the important parts of the system is a pump and check valve to maintain pressure in the tank. The amount of money which you would have to spend in installing the pump would be out of proportion to the return. Another necessary part of the system for an air starter is a distributer which directs the flow of the compressed air to the proper cylinder.

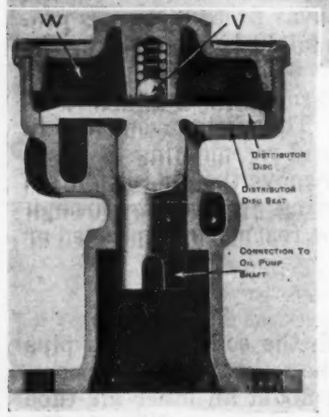
To give you an idea of the operation of a compressed air system a description of that used on the 1912 Chalmers 36 model 10 will be of interest. Fig. 2 gives a general layout of the air starting system together with the necessary piping and connections. As in all compressed air systems the operation of this device primarily consists of the introduction of charges of compressed air into the cylinders which are ready for the working stroke in their order of firing. The engine is operated with compressed air until regular explosions take place in the cylinders, after which the air supply is shut off and the motor takes up its regular operation on its own power.

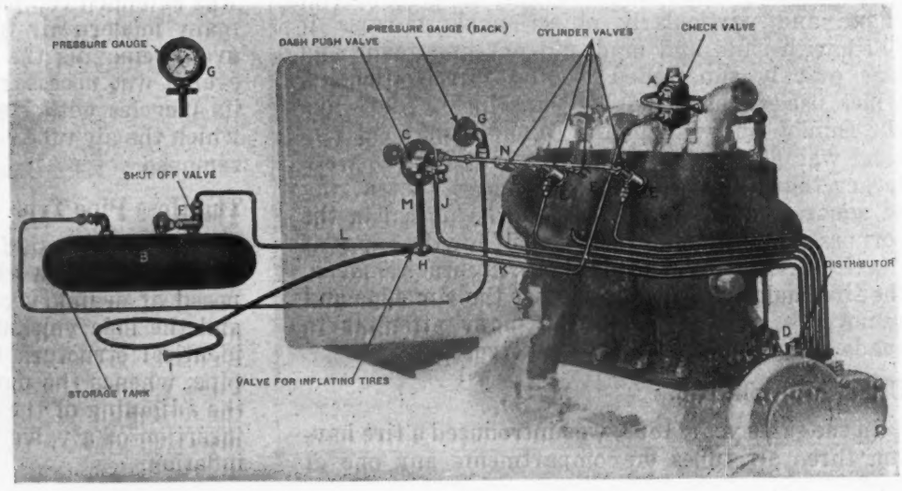
Referring to the illustrations, the parts of the Chalmers air starter are as follows: Check valve *A* for compressing air in storage tank *B*, a pipe *K* and *L* for carrying air from the check valve to the storage tank, a pipe *L* and *M* which carries air from the storage tank to the push valve *C* on the dash; a pipe *J* which carries compressed air from the push valve to the distributer *D*, four pipes through which air is carried from the distributer to the various cylinders; poppet valves *E*, one in each of the cylinders, by means of which compressed air from the distributer is admitted to the cylinder ready for the working stroke; a pressure gage *G* on the dash which keeps the operator informed of the amount of compressed air in the storage tank and a shut-off valve *F* which disconnects the starting mechanism from the storage tank.

Check Valve Is Important

The check valve is shown in Fig. 3. It is one of the most important parts of the system and on 1912 Chalmers consisted of a waterjacketed case inside of which is a check valve *O* held in place by a spiral spring *Q*. As the explosion occurs in No. 1 cylinder during the regular operation of the motor a part of the pressure of combustion passes through an







Left—Fig. 1—Details of distributer used in air starting system on 1912 Chalmers 36 model 10. The lower illustration is a vertical section

Right—Fig. 2—Layout of the air starting system used on the 1912 Chalmers model 10, showing piping

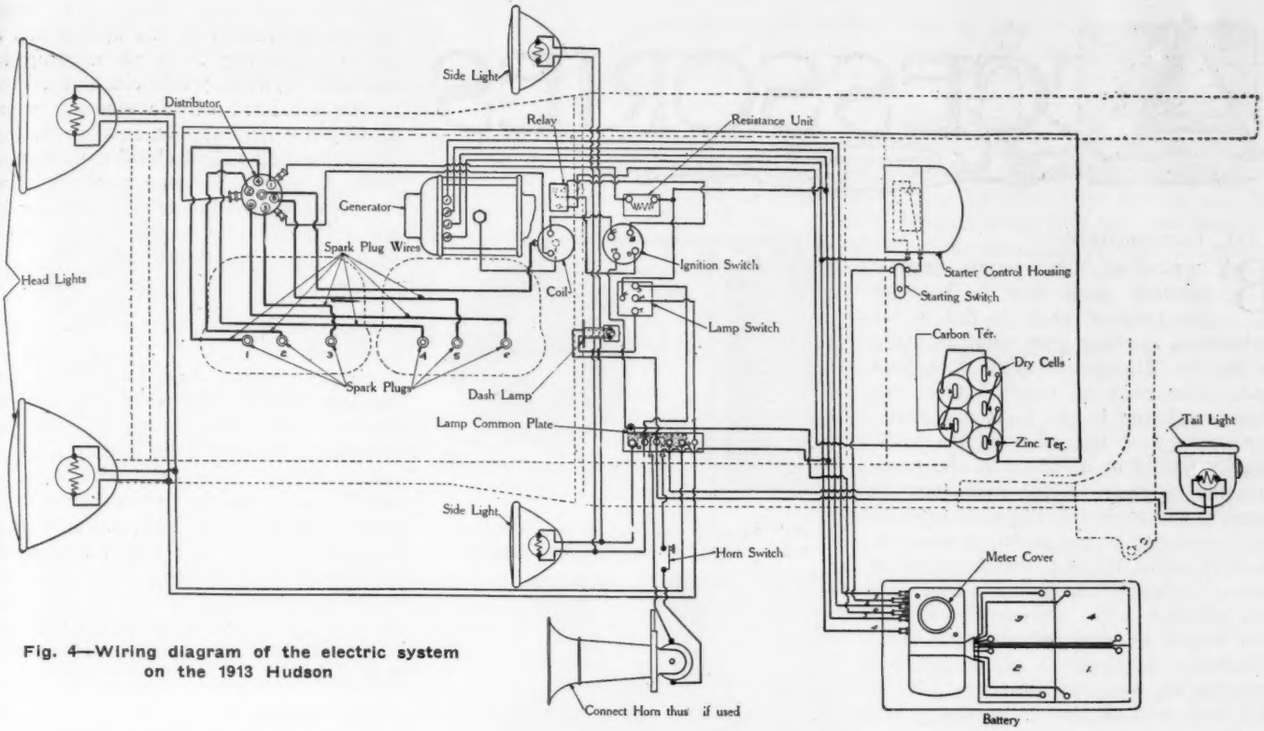


Fig. 4—Wiring diagram of the electric system on the 1913 Hudson

opening *R* lifting the valve *P* from its seat and allowing the escaping pressure to pass out through a pipe *S* into the storage tank. The storage tank on this car was lined with lead to prevent corrosion and was tested for a pressure of 600 lb.

The function of the distributer is to send charges of air into the proper cylinders ready for the working stroke in their order of firing. It is geared to the pump and magneto shaft and positively timed so that the charges of compressed air are fed to one cylinder at a time. As shown in Fig. 1, it consists merely of an air-tight case in which operates a small gear-driven disk. This disk is held in place by a steel spring and ball *V*. When air is released from the storage tank by the dash push valve it passes into the space *W* above the distributer disk. This pressure forces the disk down tightly upon its seat. As the disk revolves the air above it passes through the slot into one of the four holes beneath the disk and thence to the proper cylinder which is ready for the explosion stroke.

These are the main points of the system and as you will no doubt see it is quite a complicated installation and the equipment that you have will hardly be sufficient to allow you to arrange a starter.

Valve-Grinding Should Be Uniform

Editor THE AUTOMOBILE:—In grinding valves, should the valve be rotated in only one direction or should it be rotated back and forth without changing its position on the valve seat very materially?

Oyster Bay, N. Y. S. P. M.

—Since the object of the grinding is to make the valve seat tightly and smoothly on its seat around its entire circumference, the valve should be rotated in both directions with a uniform motion and from time to time during the process should be lifted and shifted on the seat so that all points will be ground evenly.

Wiring Diagram of 1913 Hudson

Editor THE AUTOMOBILE:—Kindly publish wiring diagram for attaching a dash ammeter to a 1913 Hudson model 54 so that same will indicate charge and discharge. I have made an attachment by cutting in the instrument in No. 1 wire from the motor generator, but this shows charge only, no discharge being indicated when motor is not running and all lights on.

Penn Yan, N. Y. A. T. B.

—It is not possible to connect an ammeter on this model so as to read charge and discharge. We note that you have inserted the instrument in the No. 1 wire from the motor generator, but this is not to be recommended. The best method is to remove the wire from the cut-out relay on top of the control switch and connect the ammeter between this wire and the terminal from which it was removed. A suitable length of wiring and metallic conduit would have to be provided to enable the ammeter to be located where desired. Wiring diagram of the electric system used in the 1913 Hudson appears in Fig. 4.

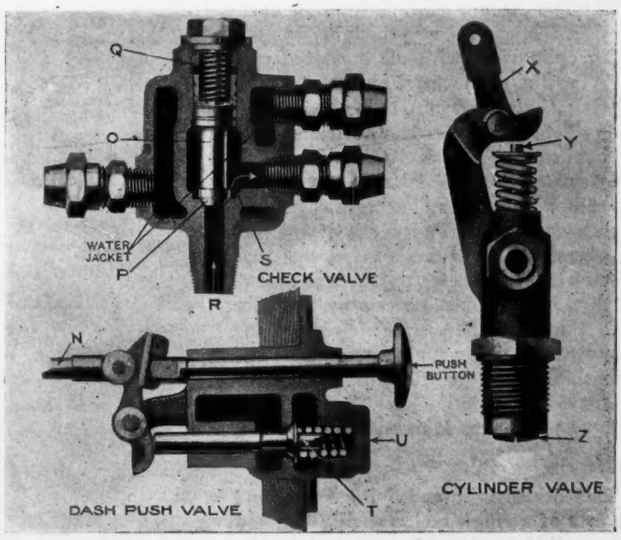
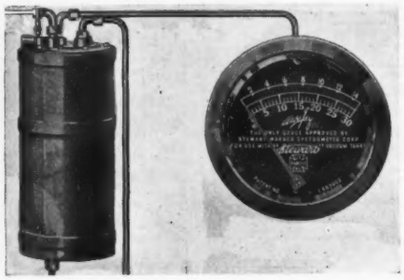


Fig. 3—Valves used in air starter on 1912 Chalmers

ACCESSORIES

J-A-Y Vacuum Gage

BY means of this vacuum gage a constant check may be kept on the gasoline as it is fed to the carbureter, showing just what is going on in the Stewart vacuum fuel feed tank. The gage is attached to a tap already existing in the tank, and registers every float operation of the tank, thereby telling at all times if the gasoline line is clear, if the carbureter is properly adjusted and if the car is making as many miles per gallon of gasoline as it should. In fact the device is a constant index to the gasoline feed system, showing when the supply in the tank should be renewed, and instantly indicates a development of any misadjustment or wasteful condition. It is easy to install, all that is necessary being the mounting of the gage on the cowlboard and attaching it to the fuel tank as indicated in the illustration. It sells for $5.—Webb Jay Corp., Karpen Bldg., Chicago, Ill.



J-A-Y vacuum gage which is a complete index to the Stewart fuel feed system

L-G Auto Lock

This lock is designed for cars having central control with a ball-and-socket type of shifting lever. The lever is locked in neutral position by a hinged ring which passes around the base of the lever. The ring is fastened by a padlock. It may be instantly applied to any car with this type of lever, it is said. Price $3.—Howard Automobile Co., San Francisco, Cal.

L-G auto lock designed for use on cars fitted with center control

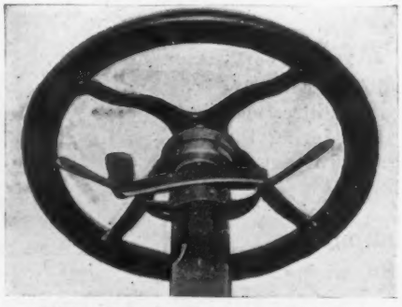
Des Moines Spark Intensifier

The Des Moines spark intensifier operates on the spark-gap principle, its body being cylindrical with an insulated core carrying the conductors, an opening permitting the spark gap to be seen. The body of the intensifier has a little bracket at one end by which it is attached to the terminal of the spark plug and at the other end a binding screw for the high-tension lead. The width of the gap is adjustable. The makers claim that plugs which are badly sooted and fouled, or that have broken porcelains, will fire with the intensifier in the circuit when they would give no spark otherwise. The intensifiers sell for 75 cents apiece, or $3 for a set of four.—Des Moines Sales & Supply Co., Des Moines, Iowa.

Work bench for the equipment of private garages. It has steel legs and iron rails

Miller Safety Pilot

This device is intended for Fords and consists of a single coiled spring inclosed in a cylinder which is attached to the front axle at the middle by a bracket held by two clip bolts. An inner cylinder connected to the spring has a clamp projecting from an opening in the outer cylinder; this clamp attaches to the cross-rod of the steering gear. The spring normally holds the steering wheels in the straight-ahead position and tends to steady steering and minimize the strain on the hands of the driver in all positions of the wheels. Price, $5.—Safety Mfg. Co., Quincy, Ill.



Miller lock for Ford control levers

Protexall Dusters

These one-piece suits are an absolute protection against dirt. They are said to be cool and loose and are hooked over the regular clothes or even over an overcoat. The material is easily washed, is strong and durable and is furnished in several colors, both plain and striped. There is a combination loose and roll collar, a wide two-button adjustable cuff, buttoned side slits giving easy access to all pockets, continuous front opening. Sizes from 36 to 50 in. corresponding to coat sizes and may be had with extra long or sleeve length for tall men.—Protexall Co., Abingdon, Ill.

Garage Bench

This bench is for automobilists who have their own garages. It is a substantial construction, 4½ ft. long by 26 in. wide and 24 in. high. It is provided with a heavy cast steel vice and a drawer large enough to hold all ordinary tools. The legs are of steel and the cross rails malleable iron. Price, $14.50.—Motor Engineering Co., Cleveland, Ohio.

Bale's Puncture Plugger

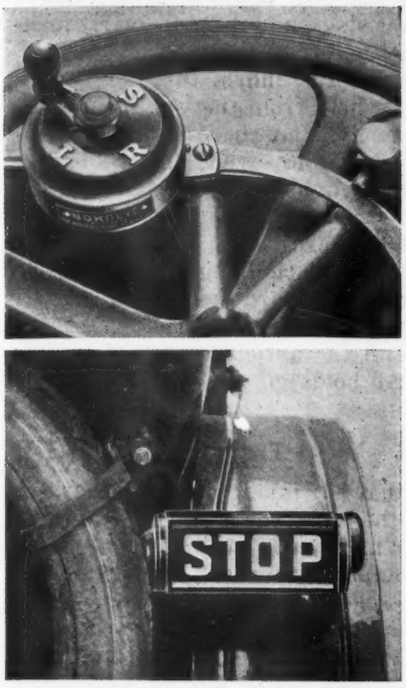
This puncture plugger is injected into the tube with the result that when a puncture occurs, the hole is clogged by the liquid and air leakage is prevented. It is a fibrous compound largely composed of rubber and is in a semi-liquid state. As soon as it enters the punctured hole, it solidifies.—Bales Puncture Plugger Co., 301 North Illinois Street, Indianapolis, Ind.

Woods Everloc Patch

This patch is applied with cement, no heat being required and is said to permanently repair either blowouts or punctures. The material comes in sheets 6 by 18 in. and may be cut to any size. One sheet will repair 100 ordinary cuts or 250 nail punctures.—Price $1. A heavier patch for casing repairs sells for $1.50. —W. C. Wood Co., Minneapolis, Minn.

Luvium Metal Ford Pistons

Lightweight pistons of Luvium metal are now being made for Ford cars. Luvium metal has a specific gravity of 2.67 to 2.70. Though having the lightness of aluminum, it is said to have a tensile strength greater than cold-rolled steel, or twice the tensile strength of cast iron. It is made in hard and malleable forms and has proven satisfactory



Above—Control of Nokolyd electric signal
Below—Nokolyd signal mounted on car

for cylinders, connecting-rods, gears, crankcases, sprockets, magneto parts and other uses, the wearing qualities being considered superior to steel by the manufacturer. The new Ford pistons, in sets of four, sell at $21 per set. The company also makes other standard pistons. Inland piston rings made by the Inland Machine Works, St. Louis, Mo., are used. —Whitman Luvium Co., St. Louis, Mo.

Nokolyd Electric Signal

The Nokolyd is an electrically operated signal; the signal proper consists of a box mounted at the rear of the car which shows, in large letters, the words, Left, Right and Stop, controlled by a small lever on the steering wheel; the lever works over a dial lettered to correspond to the signals and having a neutral position. The letters are illuminated at night. Current may be obtained from the storage battery or from a special set of dry cells. The signal lists at $20.—Nokolyd Signal Co., New York City.

Adco Shock Absorber

An inclosed auxiliary spring replaces the rear spring shackle, the movable side members being corrugated and moving in corrugated slots which give increased wearing surface and prevent rattling of the operating parts. The construction practically makes the device dirt and waterproof. There are two springs—an outer coil, which is said to perform the initial work, and a stiffer inner spring which assists the outer one when the load is heavy. An elliptical adjusting nut at the top prevents the device from getting out of adjustment. There is a removable screw plug at the bottom so that grease may be put in. Price $20 per pair.—Auto Device Mfg. Co., 62 Mason Street, Milwaukee, Wis.

Brisk Blast Jack and Pump

These tire saving jacks are made with a simple rack and sector lever operated lift worked by the foot. A similar lifting jack designed particularly for Fords and other light cars has a height of 10½ in., 6½-in. lift and weighs 3½ lb. Price $3.

The company also makes a steel foot pump. It has two seamless steel cylinders, 1½ and ⅞ in. diameter, respectively, cold rolled steel plunger rods, hardwood handle and brass screw connection to fit any tire. Price $2.50. Another design with a single 1¼-in. cylinder sells for $2.—Brisk Blast Mfg. Co., 1515 North Twenty-fifth Street, St. Louis, Mo.

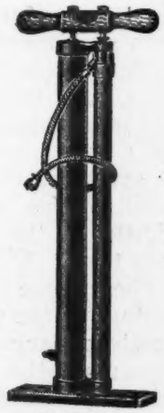
S-O-S Polishes

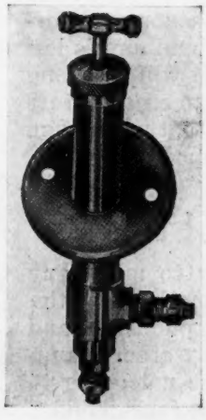
The No-Rub body polish is a liquid which will increase the brilliancy of the body surface but will not restore the finish once it has been destroyed by wear, abuse or neglect. It is applied with cheesecloth and after drying the body should be rubbed with a dry cloth. Price, pts., 57 cents; qts., $1.35.

The metal polish is a liquid which is applied with waste or cotton flannel, rubbed briskly and polished with a soft dry cloth or a chamois. Price, ½ pts., 25 cents; pts., 40 cents; qts., 75 cents.—S-O-S Mfg. Co., 167 South Stevens Street, Spokane, Wash.

Burnley Soldering Paste

The advantage of using a paste is that it spreads the solder evenly and quickly, it is said; the solder never tins before spreading. It is superior to a liquid flux because it does not run away from the point at which it is applied, and it cannot be spilled. A soldering stick is designed particularly for electrical work. It is rubbed on the heated joint and then the solder is applied in the usual way. It is wrapped in tin foil and will not corrode the wires or affect the insulation.—Burnley Battery & Mfg. Co., North East, Pa. Western Electric Co., distributor.





Brisk Blast pump

Ideal Primer and Cup

The Ideal primer is nothing more than a small gasoline pump installed on the dash or cowl. Its suction end is connected to the fuel tank and its discharge to the manifold, so that the motor may be primed by simply operating the handle. The stem of the handle is threaded so that the pump valve may be closed tightly by turning it a few times; thus leakage is prevented. It sells for $3.

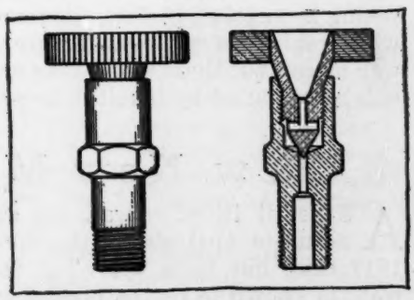
The most important feature of the Ideal priming cup is that the valve itself is of the needle type and is proof against leakage, even when used on high-compression motors. The turning knob is a fiber disk, so that there is no danger of burning the fingers. Price, nickel finish, 50 cents; brass, 40 cents.—Ideal Brass Works, Indianapolis, Ind.

Delker Trailer

The Delker two-wheeled trailer has a capacity of 1000 lb. and is made in a single model. The body is 44 by 72 in., with 8-in. panels and hardwood sills braced and ironed, and the flareboards are well braced; there is an end gate and rings at front and back so loads can be tied in. Wheels are Sarvens, riveted rims and 34 by 1¼ solid rubber tires. The axle is of 1¼-in. steel and the wheels run on Timken roller bearings. Springs are 1½ in. wide with six leaves. Finish, black with striping. Shipping weight, about 375 lb.—George Delker Co., Henderson, Ky.

Dazzle Dimmer

A diminutive roller-shade is clipped to the top of the windshield, and from it a little curtain of tinted transparent material is pulled when required. It can be put up or down at an instant's notice, and can be slipped along the windshield to any desired place. The maker states that the curtain is so tinted that it is possible to see how many persons there are in an approaching car in the face of the headlights. Price, $1.50.—The Dazzle Dimmer Co., Springfield, Mass.



Above—Ideal needle valve priming cup
Left—Ideal primer for dash mounting

The Automobile

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Materials Steady

AFTER the period at the end of last year when steel and other raw material prices seemed likely to soar to unheard-of prices, it is good to be able to record the fact that the prospects from the automobile industry's viewpoint are now brightening again. In December and January the situation looked so gloomy that actual panic threatened; now, though prices are still way up, the fear that no supplies whatever may be forthcoming seems over.

The effect of the foreign demand has been to boost American production of everything needed in Europe. In certain respects the European demand is slackening, the machine tool industry in particular is well within sight of the end of phenomenal foreign buying, while the demand for aluminum is lessening by regular, if slow, degrees. It will be a long while yet before our manufacturers can enjoy before war prices, but there is less fear now that production will be curtailed by inability to get enough steel.

Few New Multis

AS yet it is, of course, too early to make any accurate analysis of the specifications of the 1917 cars, but from what has been published and what is known to be the plan of many other manufacturers, it is obvious that there are not going to be many more eights and twelves. The four-cylinder machine is holding its own along the line; there have been several new sixes, and those formerly making sixes will mostly adhere to that type.

This tends somewhat to confirm the view which THE AUTOMOBILE has held from the very beginning of the V engine, namely, that there is ample room for all types, from the four, which is the lowest cylindricity that will provide smooth operation, to the twelve, which gives the theoretical maximum of smoothness. Having regard to the performance of the 300-cu. in. Packard aviation engine, it is rather surprising that we have heard nothing yet of a small, high grade twelve as a stock model; still there is ample time yet and the anticipation that one or two such will appear holds good.

Tonneau Windshields

ONE big change that has taken place in American automobiles in the last 2 years has been in their average comfort. While much remains to be done, much has been accomplished already, and it is thus fitting to speculate regarding the next step. That the heater, connected with the exhaust, is soon going to be expected as a stock accessory on medium and high priced cars is assured, and having thus cared for the lower extremities of the tonneau passengers the tonneau windshield appears to be the next logical step.

Of the special designs which can be bought for attachment to any car, some are fairly neat and some are very clumsy, but not one of them is as light or as simple as it might be if it were designed for one single body and if that body were designed to accommodate it. The center cowl now so popular should make the fitting of a tonneau shield a far simpler matter than it used to be with the old style of front seat back. It should provide a place for stowing the shield when not in use and points for attachment of the supports, which would not call for elaborate supporting brackets. Once tried, the tonneau shield becomes as much a necessity as the shield in front. It will be a wonderful selling argument for the first manufacturer who takes it up.

British Tax Lifted

THE proposed enormous increases in the annual license dues on automobiles in England have been abandoned as a result of the agitation of the trade press and of the various motoring organizations. The British taxes are based on cylinder bore, and would have raised the license on a Ford to over $90 a year. Instead of the increases in annual dues an extra tax for war time only has been placed on gasoline, this being 12 cents a gallon. This is in addition to the 6 cents a gallon which is the peacetime tax.

The change in the Government's plan is an advantage to the users of American cars, as these are mostly of large bore compared with the European types; but the American organizations should observe the situation with satisfaction, because it is proof of the power of motoring associations backed by a strong trade press.

$170,000,000 for Good Roads

President Signs Bill for $85,000,000—States to Pay Same Amount

WASHINGTON, D. C., July 11—*Special Telegram*—President Wilson to-day signed the good roads bill recently passed by Congress, authorizing the expenditure of $85,000,000 in 5 years by the Federal Government. The signing of the bill by the President marked the final act before the beginning of active co-operation between the national Government and the States in highway improvements, on a country-wide program.

The condition attached to the expenditure of the government appropriation is that the States shall expend an amount similar to that appropriated to them for the indicated improvement. The signing was witnessed by members of the Senate and House and representatives of various farmers' organizations. Officials of the American Automobile Assn. and the Assn. of State Highway Officials also were present.

The bill provides that in addition to the money to be spent in co-operation with the States $10,000,000 shall be provided for roads in Federal forest reserves, to be spent at the rate of $1,000,000 a year for 10 years.

The co-operative plan which became effective to-day is said to have sprung from the combined energies of the American Assn. of State Highway Officials and the American Automobile Assn.

—

Twenty-one Firms Bid for Army Light-Truck Orders

NEW YORK CITY, July 12—The Quartermaster's Department has opened bids on from one to forty ¾-ton trucks, and in response to its call, twenty-one firms have replied with bids ranging variously.

A few of the lowest bidders follow:

The Bessemer Motor Truck Co. offered to supply from one to forty ¾-ton trucks, chassis with body complete, for $995 f.o.b. Grove City, Pa. Five days after the award of order this concern promised to start shipment, and complete it within 30 days.

The Selden Motor Truck Sales Co. offered chassis model G complete, $996 each; Stewart Motor Corp., at New York, 1500-lb. chassis, $596 each; chassis with express body, $640; chassis with panel body, $676; delivery to commence on receipt of order and to be completed in 20 days.

T. B. Jeffery Co., 1 to 40 Jeffery rapid-service trucks, with express body and top cover, in lots of one to twenty-five, $850.60; in lots of twenty-five to fifty, $840.75. Delivery, three complete units every working day, to start one week after award.

General Motor Truck Co., regular model No. 15 chassis, complete with flare board body, $1,096; extra for electric self-starter, $125; extra for generator and electric lights, $80; extra for canopy tops, $40. Delivery a week after award, four a day thereafter from Pontiac, Mich.

Reo Motor Car Co., model M truck, six-cylinder, at $1,000 each. Delivery, six per working day.

Studebaker Corp., forty 1-ton, with express body, $1,200, or forty 1-ton, with staple body, $1,250, less 15 per cent, or $1,020 net. Delivery 2 weeks after award, and four a day thereafter.

Republic Motor Truck Co., ¾-ton truck, $897, including express body, f.o.b. Alma, Mich. Order completed in 5 days, ten a day.

Denby Motor Truck Co., one to forty trucks, open express, flare board bodies, furnished with solid or pneumatic tires, $990 f.o.b. Detroit; with Allis-Chalmers electrical system, $1,075. Delivery with electric system, ten in 24 hr.; fifteen every additional 24 hr.

Day-Elder Motor Truck Co., Open express body, $175; delivery starting 10 weeks after award, with two to four a week thereafter; chassis complete, $895; electric self-starter and lights, $85 extra.

—

Only Three Bids for Shop Trucks

NEW YORK CITY, July 10—Only three truck companies put in bids at the Depot Quartermaster's Department last Saturday for proposals for furnishing the United States army with from one to fifty motor truck machine shops.

The Hurlburt Motor Truck Co. stated that it could supply from one to twenty-five trucks for $7,000 each. Shipment could begin 90 days after award of order.

The J. G. Brill Co. offered to supply one to fifty machine shop truck bodies at $429 per body. The White Company put in a bid for the one to fifty complete 3-ton truck machine shops, less tools and machinery, for $3,445, delivery to start 5 weeks after placing of order, with five a week thereafter.

—

Marmon Adds Closed-Body Types

INDIANAPOLIS, IND., July 11—The Nordyke & Marmon Co. will increase its output of closed cars considerably this fall. The bodies will be built by such firms as Holbrook & Co., New York; New Haven Carriage Co.; Kimball & Co., Chicago; and the E. J. Johnson Co. of Pittsburgh.

The light-weight characteristics of the chassis will be maintained in these bodies and it is stated that Marmon closed cars will turn the scales at from 3800 lb. to 4000 lb. The floorboards are lower than usual, on account of the special frame construction and the total height to the top of the roof from the ground will be 81 in., fifty-four of these being from the floor to the inside of the roof. Extra wide rear doors will be fitted and all the windows will slide instead of folding, giving any degree of opening desired.

The standard line includes limousine, landaulet, town car and convertible sedan. Deliveries will be commenced in August or September.

—

Milburn Raises Price $100

TOLEDO, OHIO, July 10—The Milburn Wagon Co., manufacturers of the Milburn Light Electric, like the majority of other automobile manufacturers, has been compelled, owing to the increased cost of labor and materials, to advance the selling price of one of its products. Announcement is made that the model 22 brougham, formerly selling at $1,585, will be listed at $1,685, taking effect July 15.

Sales Congress Opens

President Wilson in Address to 3000 Indorses Better Business and Salesmanship

DETROIT, MICH., July 10—*Special Telegram*—President Woodrow Wilson today gave his indorsement to "the betterment of business through the betterment of salesmanship." When he addressed the World's Salesmanship Congress in the Arcadia Auditorium he was enthusiastically received by the audience of 3000, to whom he drew close in his brief but explicit remarks.

He pointed out the future that lies in store for the United States and attributed success in selling relations and in business to a close understanding between the two parties to the transaction. His opinion of his audience and of American business was indicated when he said:

"I have always believed, and I think you have always believed, that there is more business genius in the United States than anywhere else in the world."

—

King 8 Makes Providence-Detroit Run on High Gear

DETROIT, MICH., July 12—*Special Telegram*—At 7 o'clock this morning a King eight model E stock car arrived here from Providence, R. I., having made the entire distance of 837 miles on high gear. Both the gear shifter and differential housing are sealed and the car has the standard ratio of 4.64 to 1. The driver was A. F. Justin of the Longley Motor Sales Co., of Providence. Passengers were H. G. Belcher of the *Providence Tribune*, H. H. Weeks, R. J. MacKenzie and C. F. Stanley. The route covered was from Providence to Albany, through the Berkshires, Albany to Buffalo, Buffalo to Niagara, through Canada by way of Hamilton, London and Windsor. Roads through Canada were found very bad. The biggest day's travel was on Tuesday, when 349 miles were covered.

—

King Used Champion Plugs

NEW YORK CITY, July 11—The King eight-cylinder car, which covered 10,850 miles in 2 weeks during the latter part of June without stopping its engine used Champion spark plugs. The object of the test was to demonstrate the stability of the King engine and its equipment.

—

Perfection Heater on Cole

CLEVELAND, OHIO, July 7—The 1917 Cole-Springfield model will be equipped with the Perfection heater, manufactured by the Perfection-Spring Service Co., this city.

Gillette To Build Sleeve Engine

May Take Over Amplex Plant To Build Wilmo Engine and Accessories

SOUTH BEND, IND., July 8—It is unofficially stated that William Gillette, the millionaire razor king, will take over the Amplex Auto & Machine Works, located at Mishawaka. The new company will be known as the Gillette Motor Co., and will manufacture the Wilmo rotating sleeve motor patented by M. L. Williams, formerly of South Bend, now of Chicago. Mr. Williams will be interested in the plant and will move to Mishawaka, where he has purchased a residence. The company will also manufacture automobile accessories. Ray Austin of Mishawaka will be the chief engineer of the company and C. E. Erickson of Chicago will be the general manager. The Amplex was built a number of years ago and eventually was purchased by Hovey & Starrett of Detroit, later going into the hands of a receiver. It was purchased by Rudolph Kamm, one of the original stockholders, and has been operated as a job machine plant.

—

Smith Resigns from Chalmers to Join Harry Newman

MILWAUKEE, WIS., July 8—F. H. Smith, assistant sales manager of the Chalmers Motor Co., Detroit, Mich., has resigned to become associated with the Harry Newman organization, Milwaukee, Chicago, Springfield, Ill., as manager of the northwest division. The northwest division will continue to be handled from the Milwaukee store at 700-706 Grand Avenue.

—

Guy Resigns from Advance-Rumely

SOUTH BEND, IND., July 8—J. H. Guy, vice-president and treasurer of the Advance-Rumely Co., Laporte, who has been with that organization since the spring of 1913, has resigned from the concern and in a short time will return to New York. When Mr. Guy went with the Rumely company it was his intention to remain but a short time, but when the troubled conditions of 1913 came he stayed on to help straighten out the company's affairs.

—

Higrade Motors May Locate Plant in Grand Rapids

GRAND RAPIDS, MICH., July 8—Business men in this city have pledged $50,000 for the erection of a plant for the Higrade Motors Co., which will build commercial vehicles. As proposed by J. E. Pratt, W. J. Loomis and L. W. Coppock of the company, $100,000 cash working capital will be put up by the Higrade company, providing the business men of Grand Rapids will buy the site of 20 acres selected by Pratt and his associates, and will build the plant on 5 acres of it. The plant will be leased at 7 per cent of the cost, plus 3 per cent for depreciation of buildings.

The site will cost between $12,000 and $15,000 and the building in the neighborhood of $35,000. The company was incorporated last week with a capital of $250,000. J. E. Pratt heads the organization. A brief description of the truck appeared in THE AUTOMOBILE for June 29.

—

Watkin Wright Roller Sales Manager

PHILADELPHIA, PA., July 7—L. W. Watkin, Jr., who for the past 9 years has been connected with the sales and engineering department of the Standard Roller Bearing Co., has recently become sales manager of the Wright Roller Bearing Co., this city, and Spring City, where its factory is located. This company manufactures taper roller bearings for the automobile trade.

—

Benford Need Not Change Form of Plugs

NEW YORK CITY, July 11—The decision of Judge Hand, recently rendered in the case of the Champion Spark Plug Co., insures to the Benford Mfg. Co. the right to make and sell its Reliable type ½-in. plug exactly in the same form and proportions as before the initiation of the suit, the only stipulation being that none of these plugs shall have the black finish or the brand in red.

—

A New Marathon Tire

CUYAHOGA FALLS, OHIO, July 7—The Marathon Tire & Rubber Co., this city, has brought out a new ribbed tread tire, named the Runner. There will be no change in price with the usual 5000-mile guarantee.

The tread of the new tire has three parallel ridges of rubber surrounding two hollows. The design protects against side slip. The new tire is furnished with white tread and fabric body or with black tread and whipcord carcass.

—

W. J. Forbes, Accessory Man, Dies

BOSTON, MASS., July 8—W. J. Forbes, one of the pioneer accessory men in New England, and who built up a big business making bodies of various kinds for Ford cars, died here this week following an illness of some weeks. He entered the accessory field 17 years ago.

—

Brown Leaves Premier

INDIANAPOLIS, IND., July 6—H. M. Brown is resigning as stock superintendent of the Premier Motor Corp. to accept a position as production manager for a concern in northern Indiana.

Saxon Six Averages 34⅔ M. P. G.

206 in Non-Stop Run—Average 23.5 M.P.G.—175 M.P.Qt. of Oil

DETROIT, MICH., July 10—Results of the Saxon Motor Car Co.'s 300-mile nonstop run, conducted in all parts of the country by the Saxon dealers on July 1, have indicated that the Frye Motor Car Co., St. Louis, Mo., attained the greatest mileage ger gallon, and hence this dealer gets the silver loving cup that was posted as the award for the winner. The Saxon six driven in the test by this concern averaged 34 2-3 m.p.g.

In the non-stop run, 206 Saxon sixes participated, traveling a total distance of 61,800 miles, and having a grand average of 23.5 m.p.g. of gasoline and 175 miles to the quart of oil.

A newspaper man acted as observer in each case, and while the tests were not official, the results obtained are accurate in all cases so far as known. Some of the contestants encountered bad roads and hilly country, while rain interfered in other localities.

Some of the results obtained are as follows:

Place	Dealer	Average mileage per gallon
St. Louis, Mo.	Frye Motor Car Co.	34 2/3
Rochester, N. Y.	Wm. Knipper	20.1
Stockton, Cal.	Parnell & Letourneau	28
Portland, Ohio.	Saxon Motor Sales Co.	27 3/11
Toronto, Ont.	Saxon Sales Co.	24
Minneapolis, Minn.	Northwestern Automobile Co.	33.96
Geneva, N. Y.	C. J. Allen	32.15
Los Angeles, Cal.	Saxon Motor Sales Co.	27.57
Alva, Okla.	T. W. Bickel	26.67
Lincoln, Neb.	F. B. Packwood	23
Memphis, Tenn.	Memphis Motor Car Co.	21.1
Hazelton, Pa.	G. S. Danke	21.3
New Castle, Ind.	E. R. Skinner	24
Grand Rapids, Mich.	Grand Rapids Saxon Co.	27.5
Buffalo, N. Y.	Loveland Company	25.7
Cincinnati, Ohio.	Heilman Motor Car Co.	26.1
Wilkesbarre, Pa.	Sterling Motor Car Co.	18.6
Chattanooga, Tenn.	Jones Automobile Co.	19.5
Kansas City, Mo.	Bond Motor Co.	26.69
Galesburg, Ill.	Seacord & Sons	21.9
Providence, R. I.	Saxon Motor Vehicle Co.	24.6

—

25,399 Saxons Shipped in Year

DETROIT, MICH., July 10—The Saxon Motor Car Corp., this city, shipped in the fiscal year ended June 30, 25,399 cars compared with 12,099 in the previous year, an increase of 110 per cent.

In no month of the last fiscal year did shipments fall behind the corresponding month of the previous fiscal year. In June shipments were 3122 cars compared with 2710 in June, 1915. A new record for monthly shipments was established in April, 1916, when 3405 cars were shipped. Net earnings are estimated at $1,250,000.

England To Control Gasoline

—

Now Taking Automobile Census to Enable Authorities to Decide on Future Action

LONDON, ENGLAND, June 15—The long-threatened Government control of all gasoline supplies is now about to become a fact. This week an order was issued for the taking of an automobile census throughout England, every owner of a car being under an obligation to secure a form from a post office and declare to what use his car is being put, how much gasoline he has been using, and how much he considers he will use in the future. It is understood that the information obtained from this census will enable the authorities to decide on their future line of conduct.

Just before the order for this census was sent out, the gasoline committee of the Board of Trade had sent out an "Order of Priority for the Distribution of Motor Spirit." Excluding the army, the navy and the postal department, which are supplied first in any case, this order divides motor users into three classes. Class A includes the transportation of war material, fire brigades, ambulances, various government officials, police, and veterinary surgeons. Class B includes most of the commercial users of gasoline, as for agricultural purposes, the distribution of goods, taxicabs, fishing and cargo boats, motor omnibuses, railroad companies, stationary engines, and aeroplane schools. Finally in class C are grouped all other users, among them being owners of pleasure motor buses, taxicabs hired from garages, boats running for pleasure, hotels, etc.

Classes A and B First

The requirements of Classes A and B are to be given priority. Whatever supplies remain can be sold to those coming in Class C. The gasoline committee, which consists of six members of the gasoline industry working in conjunction with the government, has sent a circular letter to all garage proprietors and gasoline dealers, informing them that this priority scheme must be adhered to, and threatening more drastic measures if cooperation is not secured. At the same time the public has been reminded that the law forbids the storing of more than 60 gallons of gasoline in any one storehouse, which must be 20 feet from any other building.

If there really is a shortage of gasoline the priority scheme of distribution cannot be objected to in the main. The only unsatisfactory detail is that in Class C—comprising those people to be served last—there is no discrimination between the people who use cars merely for pleasure touring and owners who require an automobile in connection with their domestic or commercial life. There is a strong suspicion, however, that these attempted motoring restrictions are prompted more by anti-motoring feeling than by any actual or threatened shortage of gasoline. For months all England has been placarded with huge posters asking that cars should not be used for pleasure purposes. Undoubtedly much of this money has been wasted, for posters with letters four feet high have been placed in poor neighborhoods where not a single automobile owner could be found. Motorists could have been reached in a much more direct and economical manner.

—

$1,000,000 Additions for Moline Plow Tractor Dept.

MOLINE, ILL., July 5—The Moline Plow Co. has decided to enlarge its plant in order to take care of its tractor department. Plans are under way by architects for the construction of buildings which will cost $1,000,000 and give employment to 1500 men. The company proposes to erect a machine shop, 100 by 765 ft.; foundry, 180 by 360; pattern vault, 64 by 230; core room, 60 by 122; mill room, 80 by 200; and cupola room, 60 by 60. The buildings to be erected, are to be devoted exclusively to the construction of farm tractors. The demand has become so great that the present facilities are entirely inadequate.

—

British Tax Gasoline 18 Cents per Gallon

LONDON, June 25—England has abandoned the threatened double and treble taxes on automobiles in favor of a special war tax of 12 cents per gallon on gasoline. The amount will be reduced to 6 cents per gallon in the case of doctors and veterinary surgeons. The main features of the new law are the use of gasoline permits, supplied monthly for a specified amount of fuel, and the payment of the tax at the rate of 12 cents per gallon at the time of taking out the permit.

The recent automobile census has paved the way for this scheme. Owners of cars will have to apply to a central authority for a permit to purchase gasoline, and obviously this authority will have power to refuse the permit or to restrict the amount to be purchased. The tax will be paid at the time of taking out the permit, and gasoline can only be obtained on presentation of this document to the dealer. These permits will only be issued for periods of 1 month. It is officially stated that the gasoline tax will only be in force for the length of the war. The revenue obtained from this source is expected to be $4,810,000 per annum.

200,000 May Watch Tractor Tests

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Dallas Demonstrations July 18-21 Promise to Be Big Success

DALLAS, TEX., July 8—That the interest in the first national tractor show to be held at Dallas July 18 to 21 is even greater than the committee in charge of arrangements had expected is indicated by the hundreds of queries that are received daily and by reservations that are being made at local hotels. Indications are, and plans to that end are being made, that 200,000 people will witness the tractor demonstrations. These demonstrations will be given daily, each afternoon, on the 1000-acre Caruth farm 5 miles north of Dallas.

Already there have been 123 tractors registered for the demonstration and before the week's end it is expected numerous others will be registered. Entries already made are as follows:

Avery Tractor Co., Peoria, Ill., twelve tractors; Texas Harvester Co., Dallas, Tex., ten; J. I. Case Threshing Machine Co., Racine, Wis., ten; Emerson Brantingham Plow Co., Rockford, Ill., ten; Advance Rumely Thresher Co., La Porte, Ind., nine; Twin City Tractor Co., Minneapolis, Minn., eight; Sattley Bull Tractor Co., Dallas, Tex., six; Rock Island Plow Co., Rock Island, Ill., four; B. F. Avery & Sons, Louisville, Ky., four; Moline Plow Co., Moline, Ill. four; Ford Tractor Sales Co., Dallas, Tex., four; C. O. D. Tractor Co., Minneapolis, Minn., four; Denning Tractor Co., Cedar Rapids, Iowa, four; Joliet Oil Tractor Co., Joliet, Ill., three; Peoria Tractor Co., Peoria, Ill., three; Waterloo Gas Engine Co., Waterloo, Iowa, three; Parrett Tractor Co., Chicago, Ill., three; Electric Wheel Co., Quincy, Ill., three; Interstate Engine & Tractor Co., Waterloo, Iowa, three; Waite Tractor Sales Co., Chicago, Ill., three; Simplex Tractor Co., Minneapolis, Minn., three; McIntyre Mfg. Co., Columbus, Ohio, three; Allis-Chalmers Mfg. Co., Milwaukee, Wis., two; Standard Detroit Tractor Co., Detroit, Mich., two tractors.

On Tuesday, July 18, the forenoon will be used for private demonstration, the public demonstrations being made from 1 to 3 in the afternoon. In addition to plowing, the demonstrations will cover such other operations as disking, seeding, manure spreading and operating various farm machinery. Dynamometer tests will be made with a 14-in. plow and the actual pounds drawbar pull ascertained. Exhibitors may burn any fuel they like, but must obtain it from a source designated by the management.

In addition to the tractor exhibition there will also be an extensive exhibition of accessories such as may be used with and on farm tractors. Among the accessories exhibitors who will have space are:

Sumpter Electrical Co., Chicago.
Eisemann Magneto Co., Brooklyn, N. Y.
Diamond Chain Co., Indianapolis.
Kingston Co., Kokomo, Ind.
Bennett Carburetor Co., Minneapolis.
Waukesha Motor Co., Waukesha.
Beaver Motor Co., Milwaukee.
McQuay-Norris Co., St. Louis.
V. Ray Spark Plug Co., Marshalltown, Iowa.

Hyatt Roller Bearing Co., Detroit.
Piston Ring Co., Muskegon, Mich.
Reflex Ignition Co., Cleveland.
Continental Motor Co., Detroit.
Champion Spark Plug Co., Toledo.
K. W. Ignition Co., Cleveland.
Ever-Tight Ring Co., St. Louis.
Burd Ring Co., Rockford, Ill.
Perfex Radiator Co., Racine, Wis.
Kerosene Burning Carburetor Co., Detroit.
Atwater Kent Mfg. Wks., Philadelphia.
Bosch Magneto Co., New York.
New Departure Ball Bearing Co., Bristol, Conn.
Manhattan Electrical Co., New York.
Platt & Washburn Refining Co., New York.
Diamond Chain Co., Indianapolis.
Harroun Carburetor Co., Indianapolis.

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To Collect and Publish Gasoline Statistics to Reduce Prices

WASHINGTON, D. C., July 10—Another step in the fight being waged to find out the reasons for the rapid rise in the price of gasoline was taken today when the committee on mines of the House of Representatives reported favorably the Carter bill providing for the collection of information upon which Congress may base legislation to meet the constant advance in the price of gasoline. The bill, which was introduced some weeks ago by Representative Carter, of Oklahoma, authorizes the Secretary of the Interior to collect and publish all possible statistics and data relating to the production and marketing of petroleum products. These statistics and data shall embrace specifically the number of wells drilled, total amount of products and any other information of benefit and value to oil production, all of which shall be for the general information and use of the public. The bill carries an appropriation of $20,000 to defray the expenses of the investigation during the present fiscal year.

It is expected that final report of the Federal Trade Commission on its investigation into the gasoline and oil situation in the United States probably will be completed within 2 weeks.

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Chevrolet to Add in N. Y.

NEW YORK CITY, July 10—The Chevrolet Motor Co., this city, has let a contract for the erection of two additions to its automobile plant. They will be five stories, 200 by 200 ft., and three stories, 100 by 150 ft. respectively.

Mitchell Refinancing Completed

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Capital Consists of 125,000 Shares of No Par Value—Stock at $67

NEW YORK CITY, July 11—The Mitchell Motors Co., Inc., has been formed and will acquire and operate the business of the Mitchell-Lewis Motor Co., Racine, Wis. The new company has a capital of 125,000 shares, no par value, and the issue has been syndicated by Ladenburg, Thalmann & Co. and A. G. Becker & Co. of Chicago. The offering price of the stock is $67 a share.

The Mitchell-Lewis Motor Co. was founded in 1903 and the output has grown from eighty-two cars in 1904 to 6186 in 1915. For the present fiscal year to end Oct. 13, the output will be upward of 10,000 cars.

On this output and results obtained thus far, earnings for the present fiscal year are estimated at $1,400,000, or over $11 per share. During the 10 months ended Oct. 31, 1915, net profits of the company were $815,756 or $6.50 per share.

An audit by Price, Waterhouse & Co., shows total net tangible assets of $4,500,000, equivalent to $36 per share. Net current assets are over $2,000,000, of which $926,672 is cash.

Mitchell cars are being produced at present at the rate of 15,000 per annum and the present plants have an annual capacity of 18,000 cars.

The company will acquire the plant of the Mitchell Wagon Co., in which the bodies for its cars are now built. This will make the company one of the few which build the bodies for their output. It is stated that the saving through the acquisition of the body plant in the next fiscal year will amount to about $200,000.

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Maxwell to Purchase First Preferred

NEW YORK CITY, July 12—At the monthly meeting of directors of the Maxwell Motor Co. only routine business was transacted.

Under the provision of the sinking fund of Maxwell first preferred stock, the company will pay to the Central Trust Co. as agent, about $140,000 to be applied to the purchase of Maxwell first preferred after advertising for offers. The sinking fund may purchase up to, but not above, par. At present prices for the stock the sinking fund would be able to buy over 1600 shares.

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Tireoid Directors Announced

CHICAGO, ILL., July 12—The Tireoid Co., this city, manufacturer of a puncture sealer under that name, has announced its board of directors as follows: A. W. Armour, vice-president of Armour & Co., this city; M. J. Insull, president of the Middle West Utilities Co., this city; N. N. Lampert, president of the Chalmers Motor Co. of Illinois; Lafayette Markle, president of the L. Markle Co., Studebaker distributor in Chicago; H. H. Merrick, general manager of credits of Armour & Co., Chicago; H. E. Otte, vice-president of the National City Bank, Chicago; W. T. Perkins, assistant cashier of the National City Bank, Chicago; C. W. Price, president of the Overland Motor Co., Chicago; F. E. Price, vice-president of the Overland Motor Co.; W. L. Rohrer, president of the Tireoid Co.; and Maj. R. E. Wood, General Asphalt Co., Philadelphia.

Tireoid is a semi-liquid compound, mostly mineral. It was invented a year ago by R. T. Garvin, a chemist. The company guarantees for a period of 6 months from date of purchase that the compound will seal all punctures of a diameter not to exceed that made by a nail.

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Aluminum Lower

NEW YORK CITY, July 11—Activities in the automobile materials markets last week were on by a drop in aluminum and a rise in crude rubber. Lead was lower as was tin. Both lard and linseed oils rose in price. The rest of the market was steady.

Aluminum has steadily dropped during the past few weeks and is now quoting 5 cents a lb. lower than 2 weeks ago. Para rubber has been picking up in price for several weeks. Last week it rose 3 cents to 68. Ceylon rose 2 cents after a fractional loss during the previous week.

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To Cut New York City Taxicab Rates

NEW YORK CITY, July 10—Taxicab rates in this city are to be cut as a result of the decision of Chicago interests to combine with local ones to give service on a cash basis. According to the plans, 200 cars will be put in service and the lowering of rates will be con-

Daily Market Reports of the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum, lb.	.60	.60	.60	.60	.60	.58	— .02
Antimony, lb.	.17	.17	.17	.17	.17	.17	...
Beams and Channels, 100 lb.	2.67	2.67	2.67	2.67	2.67	2.67	...
Bessemer Steel, ton	42.00	42.00	42.00	42.00	42.00	42.00	...
Copper, Elec., lb.	.26½	.26½	.26½	.26½	.26½	.26½	...
Copper, Lake, lb.	.26½	.26½	.26½	.26½	.26½	.26½	...
Cottonseed Oil, bbl.	10.75	10.77	10.70	10.65	10.65	10.60	— .15
Fish Oil, Menhaden, Brown, gal.	.55	.55	.55	.55	.55	.55	...
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime, gal.	1.05	1.05	1.05	1.10	1.10	1.10	+ .05
Lead, 100 lb.	6.85	6.85	6.85	6.45	6.45	6.40	— .45
Linseed Oil, gal.	.64	.64	.64	.64	.64	.69	+ .05
Open-Hearth Steel, ton	42.00	42.00	42.00	42.00	42.00	42.00	...
Petroleum, bbl., Kans., crude	1.55	1.55	1.55	1.55	1.55	1.55	...
Petroleum, bbl., Pa., crude	2.60	2.60	2.60	2.60	2.60	2.60	...
Rapeseed Oil, refined, gal.	.92	.92	.92	.92	.92	.92	...
Rubber, Fine Up-River, Para, lb.	.65	.65	.65	.66	.66	.68	+ .03
Rubber, Ceylon, First Latex, lb.	.58	.58	.59	.59	.60	.60	+ .02
Sulphuric Acid, 60 Baume, gal.	3.00	3.00	3.00	3.00	3.00	3.00	...
Tin, 100 lb.	39.60	39.50	...	39.13	39.13	38.50	—1.10
Tire Scrap, lb.	.05¾	.05¾	.05¾	.05¾	.05¾	.05¾	...

summated through having only one charge, regardless of the number of passengers carried.

The new concern will charge as follows:

New Rates—For one, two, three, or four passengers, 20 cents for the first third of a mile, 10 cents for each succeeding third of a a mile; 1 mile, 40 cents; 2 miles, 70 cents; 3 miles, $1; 4 miles, $1.30; 5 miles, $1.60.

Present Rates—For one or two passengers, 30 cents for first half mile and 10 cents for each additional quarter of a mile; 1 mile, 50 cents; 2 miles, 90 cents; 3 miles, $1.30; 4 miles, $1.70; 5 miles, $2.10; for three or more passengers, 30 cents for the third of a mile, 10 cents for each additional sixth of a mile; 1 mile, 70 cents; 2 miles, $1.30; 3 miles, $1.90; 4 miles, $2.30; 5 miles, $3.10.

The new company will be known as the Brown Taxicab Co., and will be run jointly by the managers of the Yellow Taxicab Co., of Chicago, which has been successful, and the Town Taxi Co., Inc., and the Club Cab Corp., this city. The Walden W. Shaw Livery Co. of Chicago, will build the taxis and will have an interest in the new concern.

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Dividends Declared

Grant Motor Co., quarterly of 1¾ per cent on preferred, payable Aug. 1 to stock of record July 15.

Continental Motors Co., cash dividend of 5 per cent, payable July 15 to holders of record July 5. Company paid stock dividends of 100 per cent in February and October last and 200 per cent in October, 1912.

Stutz Motor Car Co., third dividend of $125,000 out of earnings, equal to $1.62½ per share on 75,000 shares of the Stutz Motor Co. of America.

Curb Securities Active

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Stutz, Chevrolet and United Motor in Demand—Entire Market Strong

NEW YORK CITY, July 11—Automobile stocks on the curb last week showed much activity and were in great demand. Stutz has been especially strong since Saturday, when it was influenced by the initial dividend declaration of $125,000 out of earnings of the company. Another curb stock which showed much strength was United Motors. After displaying weakness at the outset it made a sharp recovery, regaining all of the loss and making a further fractional advance. Chevrolet advanced on heavy buying to 228 or 13 points.

The Stock Exchange quotations were featured by a substantial rise of 19⅜ points by Studebaker common. Though the issues showed little activity, nevertheless prices held steady with few bad losses. Those that did gain showed increases ranging fractionally to five or six points.

Willys-Overland closed yesterday strong at 74¾ on rumors of an increased rate on the common and a common stock dividend. Overland directors are to meet this month and this action is expected to take place by interests down in Wall Street. The present dividend rate is 6 per cent or $1.50 per share, $25 par value. In the Spring of 1915 a 5 per cent stock dividend was declared. With the 200,000 car schedule fulfilled it is expected that the company will earn close to $20,000,000 this year. The 7 per cent dividend on the $15,000,000 preferred stock requires $1,050,000, after which above earnings will be equal to about 85 per cent on the $22,500,000 common outstanding.

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N. Y. Organizations to Amalgamate

NEW YORK CITY, July 7—The first steps toward amalgamation of the two large automobile organizations of New York State, representing 115 automobile clubs, were taken at a meeting of the directors of the New York State Motor Federation at Rome to-day.

Appointment of a committee of five to confer with a similar committee of the New York Automobile Assn. concerning consolidation, followed the report of President M. M. Wall, of Buffalo, who was in secret conference with President Rowe of the American Automobile Assn.

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Receiver for Twin City Track

ST. PAUL, MINN., July 8—Upon petition of the Standard Lithographing & Printing Co. Judge Hugo Hanft of the Ramsey county district court has named Philip Herzog receiver for the Twin City Speedway Co. The receiver furnished a $5,000 bond. Plans had already been made to put the company into bankruptcy and to have its assets sold to F. H. Wheeler, who resigned last Fall as president. Before the receiver was appointed Treasurer A. C. Gooding of the State of Minnesota was given a note for

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	64½	65½	+ ½
J. I. Case pfd	70	79	82	90	—4
Chalmers Motor Co. com	90	93	173	178	..
Chalmers Motor Co. pfd	96	98	98	101	—2
Chandler Motor Car Co	..	..	110	111	+1½
Chevrolet Motor Co	..	..	228	230	+13
Fisk Rubber Co. com	..	..	..	160	..
Fisk Rubber Co. 1st pfd	..	..	114	120	..
Fisk Rubber Co. 2d pfd	..	..	120	..	..
Firestone Tire & Rubber Co. com	500	506	880	..	+10
Firestone Tire & Rubber Co. pfd	109	111	112	114	..
*General Motors Co. com	156	158	470	541	..
*General Motors Co. pfd	101½	102¾	110	112	+10
*B. F. Goodrich com	51	53	74	74¾	— ½
*B. F. Goodrich pfd	103½	104	113⅛	113½	..
Goodyear Tire & Rubber com	270	273	225	230	—5
Goodyear Tire & Rubber pfd	106	107	105	107	..
Grant Motor Car Co	..	..	11	12	—1
Hupp Motor com	..	..	7½	7¾	—½
Hupp Motor pfd	..	..	80	110	+10
International Motor Co. com	12½	13½	..	9	..
International Motor Co. pfd	35	37	..	25	..
*Kelly-Springfield Tire & Rubber com	161	162	69	71	—1
*Kelly-Springfield Tire & Rub. 1st pfd	85½	87	95⅜	97	+ ⅜
*Lee Rubber & Tire Corp	..	..	46⅜	46½	—2⅛
*Maxwell Motor Co. com	34	36	78	78¼	—1
*Maxwell Motor Co. 1st pfd	82	84	84½	85	—1
*Maxwell Motor Co. 2d pfd	30¾	32	54	56	— ½
Miller Rubber Co. com	190	192	225	230	—125
Miller Rubber Co. pfd	103	106	104	106	—1
Packard Motor Car Co. com	..	112½	..	180	..
Packard Motor Car Co. pfd	96	100	100	104	..
Paige-Detroit Motor Car	..	..	..	50	..
Peerless Truck & Motor Corp	..	..	24	25	—2
Perlman Rim Corp	..	..	..	..	..
Portage Rubber Co. com	35	38	117	120	—2
Portage Rubber Co. pfd	92	95	118	119	—2
Regal Motor Co. pfd	..	..	..	..	..
Reo Motor Truck Co	15¼	16	36½	37	—2
Reo Motor Car Co	30	31	43	43½	+3
Saxon Motor Car Co	..	..	79	82	..
Standard Motor Co	..	..	5	7	—2
*Stewart Warner Speed. com	67¼	68	100	102	—2
*Stewart Warner Speed. pfd	105	107	..	..	..
*Studebaker Corp. com	77	79	132⅝	132¾	+19⅜
*Studebaker Corp. pfd	99	100	108	110	+ ¾
Stutz Motor Corp	..	..	63	63⅜	+5
Swinehart Tire & Rubber Co	77	78	86	88	—2
United Motor Corp	..	..	71⅜	71⅝	+5⅞
*U. S. Rubber Co. com	45	47	52½	53	—1¼
*U. S. Rubber Co. pfd	105½	106½	110⅛	110⅜	+ ⅞
White Motor Co. (new)	103	108	54¼	55	—3½
*Willys-Overland Co. com	123	124	74¾	75	+1¾
*Willys-Overland Co. pfd	100½	102½	107	109	+ ½

Quotations furnished by John Burnham & Co.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Auto Body Co	..	..	..	40	..
Chalmers Motor Co. com	..	92½	174	182	—2
Chalmers Motor Co. pfd	94½	98	96	..	..
Continental Motor Co. com	195	..	36¼	37¼	+1¼
Continental Motor Co. pfd	82	86	9½	10½	..
Ford Motor Co. of Canada	1275	..	..	365	..
General Motors Co. com	156	158	470	545	..
General Motors Co. pfd	101½	102½	..	116	..
Maxwell Motor Co. com	34	36	77½	80½	—2
Maxwell Motor Co. 1st pfd	81½	83½	84½	87½	..
Maxwell Motor Co. 2d pfd	31	33	55	58	..
Packard Motor Car Co. com	110	115	..	180	..
Packard Motor Car Co. pfd	96¼	100	102	104	..
Paige-Detroit Motor Car Co	..	..	..	50	..
W. K. Prudden Co	19½	21½	40	43	..
Reo Motor Car Co	29⅞	30½	42½	43½	+2½
Reo Motor Truck Co	15¼	16	36¼	37	—1¼
Studebaker Corp. com	77½	79	132	135	—2½
Studebaker Corp. pfd	98½	100½	105	..	..
C. M. Hall Lamp Co	..	..	..	33	..

INACTIVE STOCKS

Atlas Drop Forge Co	..	26	..	40	..
Kelsey Wheel Co	205	..	..	350	..
Regal Motor Car Co. pfd	..	25	17	..	..

*At close July 10, 1916—Listed New York Stock Exchange.

$680 as the proportion of the receipts for the race on July 4 belonging to the the federal militia, which paraded as a brigade before the race in front of the grandstands as a feature of the program.

W. C. Barnes, who represented the A. A. A. at the race has announced that no more races will be held on the Snelling speedway with the sanction of the American Automobile Assn. until J. F. Sperry and the present management are ousted and reorganization of its property takes place.

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Haibe's Ogren Wins on Grand Rapids 1-Mile Track

GRAND RAPIDS, MICH., July 8—Notwithstanding the fact that he went through the fence and drove over a pile of lumber, nearly hit the ambulance that was rushing to the spot to offer aid, and driving outside the course until he came to a gate where he could get back on the track, Ora Haibe, driving an Ogren, the same one with which Otto Henning went through the fence at Benton Harbor July 4 and suffered serious injury, lost less than one lap of his two-lap lead over Ralph De Palma and came back and won the 100-mile dirt track race here this afternoon, pulling down $1,000 in prize money for his rough ride.

The 1-mile track at Comstock Park has been an outlaw track, but the ban was lifted for one day and sanction was given by the American Automobile Assn. for the event in which eleven cars were entered, but only six started. The summary follows:

Car	Driver	Time	Prize
Ogren	Haibe	1:46:03.4	$1,000
Mercedes	De Palma	1:47:59.0	500
Stutz	Burt	1:50:27.2	300
Mercer	Andrus	2:05:14.8	200
Hudson	Mulford	Flagged	
Vernon Spl.	Kline	Flagged	

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Far Side Stop for Buses

NEW YORK CITY, July 10—Far side stops will be hereafter made by the Fifth Avenue buses instead of the near side as has been done for the past 15 months. According to the company, the near side stop, which worked well with trolley cars, was a pitfall for the unwary so far as the buses were concerned. Many serious accidents were narrowly averted, it was said, as, seeing a bus drawn up beside the curb on the near side, pedestrians hastened to cross the street, believing all traffic in that direction had been held up.

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Five-Passenger Chalmers Price $1,090

NEW YORK CITY, July 10—In describing the 1917 five-passenger Chalmers in THE AUTOMOBILE for June 15, the price was given as $1,050. This was an error as the price is $1,090.

Wilcox Wins at Sioux City

Premier Captures 50 and 20-Mile Events—D'Alene Wins 10-Mile

SIOUX CITY, IOWA, July 8—Howdy Wilcox in a Premier finished first in the feature race here Saturday. The event was scheduled as a 100-mile race, but after driving the 10 and 20-mile preliminary events the drivers agreed to cut the distance in half. Their claim that the track was in no condition for the longer distance seemed justified and the A. A. A. officials consented to the change.

Wilcox's time for the 50 miles was 40 min. and 59 sec., showing an average of 72.57 m.p.h. His mount is fast and the slow time recorded in the feature race of the day is indicative of the condition of the course. Dave Lewis was second, Art Johnson, third; D'Alene, fourth, and Billy Chandler, fifth.

D'Alene Takes 10-Mile Race

Wilbur D'Alene, in his sixteen-valve Duesenberg finished ahead of the field in the 10-mile race. He drove a smashing race, taking the lead at the first turn, and was never headed. He was trailed by Charlie Merz in a Peugeot, Dave Lewis in a Crawford, and Howdy Wilcox in a Premier.

Wilcox got away in the second race, the 20-mile sprint, just back of D'Alene. He followed the white Duesenberg for two laps and on the third circuit just as he reached the stands passed it. He drove a sensational race and finished first with an average of 78.4 m.p.h. D'Alene's average for the 10-mile event was 79.6 m.p.h. The spectators, what few there were of them, were given a run for their money.

Because of the dense clouds of dust stirred up by the racing machines it was impossible to see what was happening on the course. It seemed impossible that drivers could pilot their mounts into the curves at the rate of 75 m.p.h. and still avoid a spill. Several times a driver was forced to turn his car into the small ditch on the inside curve to allow one of the others to pass. Hughie Hughes, in the Devlin Duesenberg, was forced out of the contest with a broken bearing. He turned three fast laps and had gone from sixteenth position to seventh when he had to quit. He had worked wonders with his car, welding a new cylinder block and manufacturing an entirely new set of bearings out of babbit. At 10 o'clock on the morning of the race the Duesenberg was scattered all over the garage.

The work was finished so that the car arrived at the track just 10 minutes before the time set for the 50-mile race. The experience of holding automobile races and of furnishing the purse by giving the driver half of the total admission was not a success at Sioux City. There were only a few more than 2000 people in the stands and the total receipts were less than $3,500, the drivers' end of the money being less than they would have received at a meet on some ½-mile tracks in this section. First money in the 50-mile race was only $408.75.

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Must Go Over 100 M.P.H.

CHICAGO, ILL., July 6—The American speedway grand prize, for which cars must average 100 m.p.h. to qualify, will be held at the Maywood Speedway, July 29, if efforts of President D. F. Reid are successful.

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Entries for Pikes Peak

DENVER, COL., July 7—A trio of Hudson Super-sixes are being prepared for the Pikes Peak hillclimb on Aug. 10-11-12, and two of them have been officially entered. One of these is to be driven by Ralph Mulford, and the other will be driven by F. A. Patterson, of Stockton, Cal.

The course measures 12 miles, 2200 ft., and has a rise of 6686 ft. In addition to the two Hudsons now entered, there are to date three Cadillacs, a Studebaker Special, a Peugeot, and it is expected that three Chalmers cars and several Kings now in course of construction will also be entered.

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Cincinnati Entry Blanks Out

CINCINNATI, OHIO, July 8 — Entry blanks for the $30,000 sweepstakes race to be run at the new Cincinnati speedway on Labor Day, Sept. 4, have been sent out by the Cincinnati Speedway Co. This race is one of the A.A.A. 1916 championship award events and sanction has been granted by the association. Ten place prizes are offered, the first prize being $12,000. Five hundred dollars also is offered for the leading car each of the following distances: 100 miles, 200 miles and 250 miles. The race is for 300 miles and is open to 300 cu. in. cars. Entries close midnight, Aug. 26.

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Maxwell Factory Branch in Cleveland

CLEVELAND, OHIO, July 8—In line with the policy of the Maxwell Motor Co., Inc., of Detroit, to furnish direct factory connections in the most important buying centers, the company announces the establishment of a direct factory branch at 1828 Euclid Avenue. W. H. Keller will be branch manager.

Factory Miscellany

New Power Plant for Firestone—The Firestone Tire & Rubber Co., Akron, Ohio, has had plans prepared for a new power plant, understood to be of about 12,000 kw. capacity, or about doubling its present plant.

Pan-American Rubber Co. Formed—The Pan-American Rubber Co., Milwaukee, Wis., has been incorporated with a capital of $200,000 to make a celular pneumatic inner tire. It has established a plant in the Kopmeier Building, Third and Prairie Streets, and is already employing fifty operatives. F. J. Ramler is president and general manager.

Grand Cushion Spring Plans Factory—The Grand Cushion Spring Co., Flint, Mich., is planning a factory at the south end of Flint. L. A. Young, president of the Detroit Wire Spring Co., is interested.

Tubeless Tire Fitting Up Plant—The Tubeless Tire & Rubber Co., Millersburg, Ohio, is fitting up a large plant for the manufacture of automobile tires.

Commercial Body Company Formed—The Commercial Auto Body Co., St. Louis, Mo., has been incorporated with a capital stock of $50,000 by H. F. Cartwright and others, and will extend an existing plant, adding new equipment, largely wood-working.

First Gerlinger Truck—The first truck manufactured by the Gerlinger Motor Car Co., Tacoma, Wash., has been delivered to the Bilrowe Alloys Co., that city. The construction of the truck manufacturing plant was commenced the first of the year and the plant is now in shape to turn out from ten to twenty trucks per month. Plans have already been made to double the capacity of the plant at once.

Kissel Employees' Outing—One of the largest industrial outings to be held in Wisconsin this summer will be that given for its employees by the Kissel Motor Car Co., Hartford, Wis. The 2000 or more employees and families will travel to Waukesha Beach, Pewaukee Lake, in special trains to Waukesha, and then by trolley to Pewaukee Lake. No other Wisconsin industry has ever arranged for an outing on so elaborate a scale nor has any similar picnic crowd ever traveled so long a distance as this for an outing.

Koenig & Luhrs' First Truck—Koenig & Luhrs, Quincy, Ill., turned out this week the first complete truck produced by their new factory. It has a 35-hp. engine, will carry a 1500-lb. load at a speed of 20 m.p.h., and is equipped with pneumatic tires, electric lights and starter. Plans are being made to turn out a large number of these trucks annually.

Pullman to Build—The Pullman Motor Car Co., York, Pa., will build a plant at Grantley station, just south of this city. When placed in operation the new factory would at first employ at least 1000, which would be increased to twice this number within a short time.

Dreadnaught Tire Takes Over Old Co.—The Dreadnaught Tire & Rubber Co., Baltimore, Md., is formed to take over the assets, properties and business of the old company of similar name, but has no connection whatever with the old company. Officers of the company are: John Hiltz, Sr., president; J. P. Lauber, vice-president; Wm. C. Schmetisser, treasurer; H. James Lopper, secretary.

Milwaukee Stamping to Add—The Milwaukee Stamping Co., Sixty-fourth and Pullen Avenues, West Allis, Milwaukee, is about to award contracts for a large factory addition, to cost between $18,000 and $20,000. Plans have been prepared for a reinforced concrete and brick structure, 72 by 122 ft. The company does a large business with automobile manufacturers and also makes a general line of hardware specialties in sheet metal.

Tire Plant for Spooner—J. H. Newbury, Warsaw, N. C., and Akron, Ohio, interests, have practically closed a deal for the establishment of a tire and rubber factory at Spooner, Wis., where an enormous supply of hydroelectric current for manufacturing purposes is available at low rates. Spooner capital has decided to take an interest. It is proposed to build a new plant, the first unit of which will be 60 by 150 ft. in size.

The Automobile Calendar

ASSOCIATIONS

July 9 - 13 — Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.

Sept.—Indianapolis, Convention for Formation of Indiana Automobile Trade Assn., under auspices of N. A. T. A., Hotel Claypool.

Oct. 2-5—St. Louis, Fall Meeting Assn. of Automobile Accessory Jobbers.

Dec. 2-9—Electricians' Countrywide Celebration.

CONTESTS

July 14-15—Los Angeles to San Diego, Commercial Vehicle Endurance and Reliability Demonstration.

July 15 — Portland, Ore., Track Race, Northwest Auto Assn.

July 15—Omaha, Neb., Speedway Race.

July 15—North Yakima, Wash., Track Race, Hiller-Riegel Co.

July 20—Uniontown (Pa.) Hillclimb, Uniontown Motoring Assn.

July 22—Kansas City, West Speedway Race, Kansas City Speedway Co.

July 22—Oriskany Falls, N. Y., Hillclimb, Auto Club of Utica.

Aug. 5—Tacoma Speedway Race, Tacoma Speedway Association.

Aug. 11-12—Pikes Peak, Col., Hill Climb, Pikes Peak Auto Highway Co.

Aug. 12—Portland, Ore., Track Race, Hiller-Riegel Co.

Aug. 18-19—Elgin Road Race, Chicago Auto Club.

Aug. 26—Kalamazoo, Mich., 100-Mile Track Race.

Sept. 1-2—New York, N. Y., Sheepshead Bay Speedway, 24-Hour Race, Trade Racing Assn.

Sept. 4—Elmira, N. Y., Track Race, Elmira Auto and Motorcycle Racing Assn.

Sept. 4—Cincinnati, Ohio, Speedway, Cincinnati Speedway Co.

Sept. 4—Newark, N. J., Track Race, Olympic Park, Racing Assn.

Sept. 4—Indianapolis Speedway Race.

Sept. 4—Des Moines Speedway Invitation Race. Limited to six entries.

Sept. 4-5 — Spokane, Wash., Track Race, Inland Auto Assn.

Sept. 16—Providence Speedway Race.

Sept. 18—North Yakima, Wash., Track Race, Washington State Fair.

Sept. 29—Trenton, N. J., Inter-State Fair. H. P. Murphy, Racing Sec.

Sept. 30 — New York City, Sheepshead Bay Speedway Race.

Oct. 7 — Philadelphia Speedway Race.

Oct 7—Omaha Speedway Race.

Oct. 14 — Chicago Speedway Race.

Oct. 19—Indianapolis, Ind., Race Indianapolis Motor Speedway.

Oct. 21 — Kalamazoo, Mich., Track Races, Kalamazoo, Motor Speedway.

Nov. 16 and 18—Santa Monica, Cal., Vanderbilt Cup and Grand Prix Races.

GOOD ROADS

Sept. 6-7—St. Paul, Minn., Good Roads Congress, Auditorium.

SHOWS

Sept. 2-9—Columbus, Ohio, Fall Show, Ohio State Fair, Columbus Automobile Show Co.

Sept. 10-16 — Milwaukee, Wis., Show, Wisconsin State Fair, Machinery Bldg.

Aug. 2-9—Hollywood and West End, N. J., Show, Atlantic Exhibition Co.

Jan. 6-13, 1917—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.

Jan. 27-Feb. 3, 1917—Chicago, Ill., Show, Coliseum, National Automobile Chamber of Commerce.

TRACTOR

July 17-21—Dallas, Tex., Tractor Demonstration.

July 24-28—Hutchinson, Kan., Tractor Demonstration.

July 31-Aug. 4—St. Louis, Mo., Tractor Demonstration.

Aug. 7-11—Fremont, Neb., Tractor Demonstration.

Aug. 14-18—Cedar Rapids, Iowa, Tractor Demonstration.

Aug. 21-25—Bloomington, Ill., Tractor Demonstration.

Aug. 28-Sept. 1—Indiana Tractor Demonstration.

Sept. 4-8—Madison, Wis., Tractor Demonstration.

Sept. 11-16 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.

The Week in the Industry

New England Trade Items—The Metz company, Waltham, Mass., has moved its retail branch at Boston from that city to Cambridge where it has a service department in the former home of the Ford.

The Longley Motor Co., Providence, R. I., agent for the King and Dort, has moved into its new home on Broad Street.

Frank Coveney, for some years with the Studebaker Corp. at Boston, Mass., has joined the Nettleton-Crittenden Co. agent for the Chandler in that city.

The Imperial Auto Supply Co., with branches at New York, Chicago and Minneapolis, has opened a branch at Springfield, Mass.

W. B. Hennigan, for some years with the Winton branch at Boston, Mass, is now sales manager of the Paige Detroit agency at that city.

A persistent rumor states that the Sterling Motor Car Co., Brockton Mass., has received another large war order.

Mountain Trade—The Auto Equipment, Denver, celebrated its seventh anniversary with a banquet for its employees in the Metropole Hotel last week. This wholesale supply house at 1554-1556 Broadway now has a territory of fourteen States and reports on business outside of the Denver district were made by L. E. Robinson, manager of the Colorado Springs branch, and J. R. Alexander, traveling representative. President S. T. McCollum, Treasurer S. E. Howe, Jr., and Publicity Manager A. P. Porter conducted a lively program of business betterment talks. The concern has recently enlarged its display facilities and is regarded as one of the strongest accessory houses in the Rocky Mountain region.

The Gould-Esser Co., Denver, a machinery concern at 1613 Blake Street, has secured the Colorado distributing agency for the Troy trailer.

The Mulnix & Rarie Auto Sales Co., Denver, the new name under which the firm of Mulnix & Rarie is operating in new quarters at 35 East Colfax Avenue, has taken the Roamer and Halliday distributing agencies for Colorado and Wyoming in addition to the Grant and Pathfinder agencies it has held for the same territory.

A. O. Stout, Buckingham, Col., has secured the Pullman agency for Logan and Sedgwick Counties.

The Wagner Garage Co., Denver, Kelly-Springfield and Denby truck distributor for Colorado, has had its garage at 1541 Cleveland Place appointed official service station for the Scripps-Booth.

The Steamboat Mercantile Co., Steamboat Springs, Col., has taken the Velie agency for Routt and Moffat Counties.

The C-B Auto & Service Co., Denver, a new $5,000 concern organized by W. C. Borah and C. A. and E. N. Harman, who are respectively president, vice-president and secretary of the firm, has opened a used-car and rental business at 1439 Cleveland Place.

W. Aldridge, Denver, general manager and one of the organizers of the Highway Auto Sales Co., 1435 Cleveland Place, Crow-Elkhart and Argo distributors for Colorado, has sold his interest and gone out of the motor car business.

The Vim Truck Sales Co., Denver, is the name of a new Colorado distributing agency for the Vim truck opened at 801-807 Broadway by C. F. Cole, formerly Pathfinder distributor for Colorado.

Canadian News Items—The Ford plant in Winnipeg, Man., delivered this month 300 cars to buyers. Last week, to Winnipeg owners alone, forty cars were sold.

In 1909, the first year the Ford company was there, the number of Ford cars sold in Manitoba was thirty; in Saskatchewan, twenty-one, and in Alberta, twenty-one. These were sold at a price of $1,350, without top, windshield or speedometer. Last year, 1915, the company sold in the same territory 4200 cars, as against seventy-three in 1909, at a price of $630 each, fully equipped.

This year, estimated on a basis of present sales, it is anticipated by the management of the Ford company that over the same territory they will have distributed 8000 cars, sold at a price of $570, fully equipped.

Girdwood Lamb Motors, Ltd., is the name of a new motor company just formed in Montreal and incorporated with a capital of $500,000. The three-floor building situated at 973 St. Catherine Street West has been taken as its Montreal headquarters. In addition to handling the agencies of the Maxwell and Reo cars and trucks, one of the most up-to-date repair shops in the Province of Quebec has been installed on the premises. In addition, there is garage room for 160 cars. Mr. R. F. Girdwood, one of the oldest automobile dealers in this city, has been appointed president and Mr. Lamb has been appointed secretary-treasurer.

E. J. Parker, one of the best-known automobile men in Western Canada, has taken the position of general supervisor with the Chalmers Motor Co., having jurisdiction over the territory from Fort William to the Western Coast.

The Globe Shock-Absorbing Tire Co. of Canada has incorporated at Toronto, Ont., with a capital of $1,000,000 to manufacture a resilient or shock-absorbing vehicle, automobile and commercial tire, head office to be at St. Catherines, Ont. Incorporaters are Isaac Normandy and Howard J. Ecclestone, of St. Catherines.

The F. S. Carr Rubber Co. of Canada has been incorporated at Ottawa with a capital of $200,000 to manufacture rubber, automobile and carriage fabrics. Head office to be situated at Granby, Que., and the incorporators are J. E. Day, J. M. Ferguson and J. P. Walsh, all of Toronto.

St. Louis Items—New agencies and changes in existing sales arrangements during the past week in St. Louis are:

The Newell Motor Car Co. will handle the Detroiter, this arrangement having been completed during a visit of W. H. Van Duesen, director of sales for the Detroiter Motor Car Co. The Newell company now becomes distributer for Haynes, Sun, Dort and Detroiter.

The El-car Motor Sales Co. has been designated as the distributing agency for the El-car, manufactured by the Elkhart Carriage & Motor Co., Elkhart, Ind. The territory of the company includes the St. Louis trade district.

The Fred Campbell Auto Supply Co. is exclusive sales agent here for the White Star Refining Co., Detroit, and has stocked the complete line of that company.

The John Berry Automobile Co. has become agent for the Dearborn 1-ton truck attachment. The attachment was put on exhibition Tuesday.

D. A. Livingston, well known to the trade here as a salesman, announces the organization of the Supreme Motor Co., which will begin business in this city early in August. The new company has closed a contract for the selling agency of the Simplex-Crane chassis. The company will probably handle two lower priced lines but has not determined upon these, nor has it decided definitely upon the location of showrooms.

E. E. Denniston has taken charge of the wholesale department of the Overland Automobile Co., St. Louis. Mr. Denniston comes from Buffalo, N. Y., where he was distributer for Stevens-Duryea and later conducted a truck-body-building plant. Here he succeeds H. A. DeWitt, who resigned as sales manager.